GAS JOURNAL

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COKE OVENS AND PUBLIC GAS SUPPLY

EARLY this year, before the publication of the Gas Bill, we argued that the gas industry and the coke oven industry supplying gas to the public should be placed under unified control, that all carbonizing and ancillary processes, including coke production, should be concentrated in one authority. We contended—and we still hold the view—that this is the practical means of securing a full measure of co-operation between two industries so obviously linked in common aim. We would emphasize that we were referring to that part of the coke oven industry supplying gas to the public. Few can have given more thought to this question of the relationship between the coke oven industry and the gas industry than has Dr. G. E. Foxwell. It is an all-important question, and we welcome a paper he recently gave first to the Midland Section and then to the Northern Section of the Coke Oven Managers' Association. Taking as its title "The Carbonizing Industries after Nationalization," the author set out a penetrative and pertinent analysis of the situation. He divided the coke oven industry into four sections—the iron and steel industry section; the colliery section; the gas section; the reactive coke section. And he expressed the opinion that coke ovens coming within the "colliery section," being those which must collaborate with the Area Gas Boards by the provisions of the Gas Act, should in the best interests of the community come within the ownership of the gas industry. By-product coking is no longer an industrial entity, but must be regarded as composed of sections each related to one or more large industries and providing those industries with essential products. "Increased supply of coke and gas to the domestic user is likely to become of primary importance. . . . The need for providing coke of the right quality and the many problems which must be solved, such as meeting peak loads and co-ordinating the demand for gas and coke, suggest that those ovens now controlled by the National Coal Board should be linked closely with the gas industry and, possibly, transferred to the ownership of the Area Gas Boards." We would reiterate the point which we have previously emphasized that some large gas undertakings rely almost entirely or very extensively on coke oven gas. The gas industry is meeting the demands of gas consumers statutorily. The coke ovens are not supplying gas statutorily. As Dr. Foxwell said towards the end of his closely reasoned paper, which contained a mass of data in support of his conclusions, coke ovens other than those situated at iron and steel works will be essentially a part of the gas industry as far as their functions are concerned. And he added that the prospects of producing gas economically by pithead carbonization are slight except in districts where several pithead plants linked by a grid and spaced only a few miles apart over the area might serve a populous industrial district; and that long-distance gas transmission is economic only when gas alone is supplied—not when coke has to be transported over the same distance in roughly the proportions now supplied by the gas industry. The author shares our view that the maximum conservation and the most efficient utilization of coal can be ensured only by placing all carbonizing processes concerned with the supply of gas to the public under one authority.

SALESMANSHIP AND NATIONALIZATION

FOR years gas salesmen have been told to consider the point of view of the customer, and in encouraging this businesslike idea many executives in the gas industry have done much. Many executives, on the other hand, have afforded little practical support to the service angle; and we think that, in general, the level of service in the industry is not unduly high. Again, generally speaking, gas salesmen are not given the hope of any considerable, or, indeed, commensurate, reward for their work. Of course, since 1939 the gas salesman has been confronted with a set of controls of wide variety. Some of the controls appear to be, and we think are, fantastic. We appreciate the salesman's difficulties while realizing that the industry depends on the satisfactory sale of its products. It is good to note, however, that through the war members of the Salesmen's Circles maintained an enthusiastic outlook and devoted thought to improving their technical knowledge, and substituting for selling a new conception of service to the consumer. That denoted more than mere faith in their commodity; it was a proof of the Circles' effective constitution. To-day we witness with satisfaction the gathering momentum of the Circles' activities. Some Circles which have been dormant have been resuscitated; and we welcome the formation of a new Circle, the Southern District (Sussex Area), a report of whose first meeting at Brighton will be published in the November issue of "GAS SERVICE." A notice to the effect that such a Circle was envisaged brought over a hundred members of sales staffs to the first meeting at Brighton on Oct. 8. Here is an indication of the healthy keenness that exists and proof of the concerted desire for this type of association. Our continued and intimate association with the affairs of the Circles, however, gives us an insight into their present anxiety, which we feel will be transitory. Dissipation of the anxiety calls for the backing of those upon whom will largely rest the day-to-day functioning of the gas industry.

We have spoken of our intimate contact with the Circles throughout the country since their inception. And this leads us to remark that salesmen attending the meetings which they organize do so not only to increase their technical knowledge and understanding of their place in the team, but because they are friends; and that is a factor sometimes overlooked. It was, we feel, with these thoughts in mind that Col. W. M. Carr addressed the North-Western Circle on Sept. 22. He said: "I hope, when they (the 12 Area Boards)

are established, that within those Boards will be the maximum of de-centralization. You are a personal service. You must lose none of that personal service and contact with our consumers that you are able to maintain to-day under your present constitution. If the new constitution disturbs that, it will be a serious matter and it will fail. In other words, you must remain to a very great extent local entities co-ordinated in order that you may provide a cheaper service and a better service, but only co-ordinated for these objectives. I believe that the interchange of views between your districts within the organization with proper de-centralization will be maintained. I hope it will be possible for you to continue to interchange views and discuss your problems in an organization that will be substantially what it is to-day." We support Colonel Carr in his hopes.

GAS (NOTICES) REGULATIONS, 1948

In exercise of powers conferred on him by Section 16 of the Gas Act the Minister of Fuel and Power has made the Gas (Notices) Regulations, 1948 (Statutory Instruments, 1948, No. 2242), prescribing the period within which he is required to serve notice on every person who in his opinion is an undertaker to whom Part 2 of the Gas Act applies (other than a statutory undertaker); the form in which notice may be given to the Minister by a person who claims to be such an undertaker but on whom the Minister has not served a notice; and the period within which the Minister may serve a counter-notice to such a notice served on him. The time prescribed in the first clause is the period ending Nov. 13. The form of notice to the Minister defines the grounds for such notice and provides for the insertion of "non-statutory undertaker," or "gas holding company," or "ancillary gas undertaker" as the case may be. The time for counter-notices by the Minister is prescribed as two months from the service of notice. Copies of the Regulations may be obtained from H.M. Stationery Office, price 1d.

TRAINING IN CRAFTSMANSHIP

The gas industry is faced with a dearth of prospective juvenile employees, particularly fitters' mates, a dearth which in view of the wartime fall in the birthrate and the post-war changes in the national educational system is likely to become more acute over the next few years. During the war many young people were "spoilt" with uneconomically high wages for work that was not always of a high standard, and although circumstances have changed there is still, by way of a legacy of the war years, a lack of appreciation of the fact that good honest work is the only passport to a well-paid job. So far as those who have received something more than an elementary education are concerned, the Institution of Gas Engineers has already served a very useful purpose by the publication of its *Careers in the Gas Industry*, but it seems to have been left to individual undertakings to cope with the problem of attracting entrants to the ranks of manual workers. One of the best efforts in this direction that we have seen so far is a leaflet which has gone out from the Croydon Gas Company to all prospective school-leavers in its area, explaining in simple language the opportunities the Company offers for thorough training with a view to making qualified gas fitters. Hours, pay, holidays, and promotion prospects are clearly stated. So far as training is concerned, one day per week for four years is spent at the local Polytechnic for training in mathematics, general science, electricity, mechanics, chemistry, and physics; in addition the theoretical side of gas supply is explained and instruction is given in practical gas fitting. At the end of two years' training there is the City and Guilds of London Intermediate Examination in Gas Fitting, and at the end of four years the Final Grade of that examination. The other days of the week are spent actually helping with gas-fitting work and looking after gas apparatus and piping already in use. The leaflet emphasizes the national importance of the gas industry and concludes with particulars of the Company's sports and recreational facilities. We mention the Croydon leaflet in particular, not because of any desire, either on the Company's part or our own, to extol its virtues, but because it is an example from one of the large metropolitan undertakings of what any company or local authority, however small, might do to interest school-leavers in a trained and well-paid future which is of benefit both to them and to the nation.

MORE STEEL, SAME PLANT

A disclosure of the likely future expansion of the steel industry in Britain, which will have to be considered in relation to future supplies of gas, is contained in the current issue of the Steel Federation's statistical bulletin. Government experts, says the bulletin, have recently estimated that the demand for steel in the early 1950's is likely to reach 18 mill. tons: the present expansion plan of the industry, worked out in 1945 and approved by the Government in the following year, provides for a capacity of 16 mill. tons a year, and the bulletin states that a number of new factors have become apparent. It is much better realized now than it was in 1945 how largely this country will have to rely on the export of machinery, vehicles, and other products largely dependent on steel. This change arises from the fact that exports of coal and textiles on the pre-war scale are not likely in the future. The need to save other materials such as timber, for which steel serves as a substitute, will add to the demand. Two other new factors are the programme of colonial development and the expansion of the oil production and refining industry. The Federation has come to the conclusion that the completion of the present expansion plan will, in fact, provide sufficient capacity for the production of 17.5 mill. or possible 18 mill. tons a year by the early 1950's, apart from any steel imports. Reservations are, of course, made as regards the supply of raw materials. Coke, says the bulletin, has been in short supply and may be so again, and iron ore supplies are limited.

QUALIFIED HOPE

In the "JOURNAL" report last week of the meeting of the Eastern District Tar Board, Mr. J. Davidson Pratt, Chairman of the British Road Tar Association, was quoted as saying that by 1951 more than 500,000 tons of additional tar would become available annually. There could, he said, be no more appropriate market than that which was on our own doorstep—the roads of our own country. The outlook for the use of this extra tar in this "appropriate" way seems a little brighter as the result of an exchange of letters between the Roads Improvement Association and the Minister of Transport. The Minister states that he has some hope of being able to relax the restrictions on road maintenance "in the not too distant future, though this will depend largely on the maintenance or increase of the present rate of economic recovery." The letter agrees with the Association that a higher level of maintenance would be desirable but holds that the policy of restriction, which led to the discharge of 20,000 roadmen, "was the right one on the circumstances." The Association claimed that enforced wartime neglect had left roads in a perilous condition and any restrictions on urgent repairs would not only increase the dangers of all road travel but pile up liabilities which would have to be met in the future at heavily increased costs. That this was happening was shown by the increase in distorted, cracked, and disintegrated road surfaces.

A MATTER OF LAW

London Transport Executive has decided to be more friendly towards its passengers. Notices in road and rail vehicles, on stations, maps and timetables will in future, so far as possible, be written in simpler and more friendly language. Bureaucratic and "official" language will be avoided and more easily understood phrasing substituted, for it is claimed more homely language than that now in use is easier to understand and often shorter. The authority has made a start by rewriting in the new style the notices to passengers on the new country bus services map which has just been published. In the old style a familiar notice reads: "The London Passenger Transport Board cannot be held responsible for failure to adhere to the scheduled times of the buses, nor can they guarantee the running of the services to be as stated, though every effort will be made to maintain them. In inclement weather on Sundays, certain buses are liable to be cancelled without notice." Rewritten, this notice now says: "You cannot hold London Transport responsible if your bus is late or does not run. London Transport does not guarantee that its services will keep to the timetable or will run at all, although, of course, it does its best to see that they do." Delightful though the new notice may be, it only serves to make more obvious a snag which should be a source of delight to any barrack-room lawyer. A gas undertaking is required by law to provide a supply of gas wherever possible, and to maintain that supply at a given pressure. But suppose that London Transport's failure to guarantee that its services "will keep to the timetable or will run at all" causes a shift at a gas-works to be late for duty, or even not turn up at all if the buses failed to run in "inclement weather." Since the gas undertaking cannot hold the transport authority responsible, it will have to face the music alone even though both gas and transport are equally public services. Growing older, people are expected to assume more responsibility.

London Transport, as a pre-war example of a public corporation, has apparently thrown away its cares and duties in putting on years. Perhaps when gas has been long enough nationalized it will be possible to exhibit friendly notices in showrooms and offices politely informing the public that " the Area Board does not guarantee that its services will keep to the statutory pressure, or that there will be any gas at all."

Personal

Leicester Gas Committee has appointed Mr. W. A. PASK, of Darlington, as Deputy Gas Manager, and Mr. J. B. WALSH, of Stockport, as Distribution Engineer.

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After nearly 49 years' service with Croydon Gas Company, Mr. J. HILLS, District Chief Storekeeper, has retired. He was guest of honour at a farewell party at which Mr. D. V. O'Meara, General Manager, presided. Mr. Hills was presented with an armchair.

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Mr. HAROLD COLBECK, Wages Clerk to the Harrogate Gas Company's Distribution Department, retired on Oct. 1 after serving the Company for 49 years. The occasion was marked by a gift to Mr. Colbeck of a watch presented on behalf of the staff by Mr. Alexander McDonald, General Manager of the York, Harrogate, and District Group of Gas Companies.

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Mr. T. H. Y. BONSEY, of the British Aluminium Co., Ltd., who was seconded to the Control Commission for Germany in 1945, and was appointed Chief Control Officer in Metallurgy Non-Ferrous Division, has relinquished his appointment in order to become Sales Manager to the Aluminium Wire and Cable Co., Ltd., of Swansea and London. Mr. C. H. E. RIDPATH, who has been in charge of the British Aluminium Company's electrical sales development section for a number of years and has been largely responsible for the development of the use of steel-cored aluminium overhead conductors and fittings, has also joined the new Company as Deputy Sales Manager.

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Mr. EDWARD S. SYMONDS has been appointed Managing Director of Ewart & Son, Ltd., as from Oct. 1. Mr. Symonds is also Advisory Engineer of the Imperial Continental Gas Association, and during the war was in charge of the Royal Ordnance Factory at Chorley, Lancs. He joined the Board of Ewart & Son, Ltd., in January last, and is Chairman of Ewart Catering Equipment, Ltd. As from Oct. 1 Mr. GEORGE EWART, great-grandson of the founder of the business and a Director of the Company, has been appointed Sales Director. Mr. HENRY L. LOWE, A.C.A., Secretary of the Company, has been appointed to fill the vacancy on the Board arising from the resignation of Mr. J. H. EWART, whose agreement with the Company expired on Sept. 30. Mr. J. H. Ewart remains a Director of Ewart Holdings, Ltd.

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Sir GUY NOTT-BOWER, K.B.E., C.B., has been appointed Director of Public Relations for the National Coal Board. He is a Deputy Secretary of the Ministry of Fuel and Power and has been released from his present duties with the consent of the Minister. He will take up his duties with the National Coal Board on Nov. 1. Sir Guy Nott-Bower entered the Ceylon Civil Service in 1914 and transferred to the Inland Revenue Department two years later. In 1919 he served for a short time with both the Home Office and the Ministry of Labour, and the following year transferred to the Mines Department. In 1939 he was posted to the Air Ministry but returned to the Mines Department in 1941 as Deputy Under-Secretary for Mines. On the formation of the Ministry of Fuel and Power in 1942 he was appointed Deputy Secretary. Sir Guy was Secretary to the Royal Commission on Mining Subsidence from 1923 to 1927.

Obituary

Mr. JAMES O. CRAWFORD, Manager of Stevenston Gas Company, died at Stevenston on Oct. 10.

* * *

The death occurred on Sept. 28 of Mr. J. WEMYSS THORNTON, Managing Director of Robert Crawford & Co., Ltd., insurance brokers, Sackville House, Fenchurch Street, London. With the inauguration of the National Gas Council scheme of comprehensive insurance more than a quarter of a century ago, Mr. Thornton, with energy and enthusiasm, devoted much time and attention to studying the various risks—some quite unusual—to which the gas industry found itself exposed and set himself the task of securing adequate insurance against those risks at rates lower than any previously available or even thought possible. The success which attended his efforts increased his enthusiasm and his self-imposed task developed into an absorbing hobby. He travelled thousands of miles each year by road and rail to establish and maintain those personal contacts which he regarded as essential and enjoyed so much. To ensure continuity of service Messrs. C. S. BENNETT, A. J. GILLETT, M. S. MORGAN, and A. H. PUGH, all of whom have been members of the staff for upwards of 23 years, have been appointed to the Board. The new Directors have been associated with the Company during the development of the scheme inaugurated by the National Gas Council, later adopted by the British Gas Council, and worked in close co-operation with Mr. Thornton.

Letters to the Editor

James Small

DEAR SIR,—I am seeking information for the records of the Institution about the late Mr. James Small, who, I understand, went to Norway from England as a partner of Mr. James Malam, the erector of the gas-works in Oslo. Malam and Small are reported to have obtained the contract, in August, 1849, for the erection and operation of a gas-works at Trondheim, of which Mr. Small became the first Manager in January, 1853.

I should be grateful for any further information concerning Mr. James Small and, in particular, the date and place of his birth, his education and occupation, before going to Norway, his subsequent history, and the date and place of his death. Any information on these points, accompanied if possible by a portrait of Mr. Small (on loan), would be very much appreciated.

Yours faithfully,

W. T. K. BRAUNHOLTZ,
Secretary.

Institution of Gas Engineers,
1, Grosvenor Place,
London, S.W.1.
Oct. 15, 1948.

Functionalism and Management

DEAR SIR,—As a member of the Institution of Gas Engineers for over 40 years, will you permit me through your columns to lodge a somewhat belated protest against the extremely irritating and rather nauseating collection of words entitled " Functionalism as a Tool of Management " presented before the Institution at its Annual Meeting ?

We are told that in 1940 all available resources had to be mobilized and all the muckage stripped from the problem. It is a safe prophecy that, if the unorthodox ideas enumerated in the paper are translated into action, there will be, before many years have passed, more muckage to be stripped from many new problems in the Liverpool Gas Company.

The author states that had he been delivering his paper to a body whose prime training had been in administration rather than in production the weight and sequence of the sections might well have been different. It is difficult to understand why the idea is so prevalent that a man trained as an engineer must in consequence lack capacity as an administrator. The decline in the efficiency and status of the gas industry has been brought about more by the superseding of engineers by laymen than by any other factor.

In the author's view, much clerical work should be treated as dirty marks on pieces of paper. Quite so, and my view is that this classical example of dynamic administration is not worthy of record in the *Transactions* of the Institution of Gas Engineers.

Yours truly,

C. F. BROADHEAD,
Managing Director.

Colonial Gas Association,
360, Collins Street,
Melbourne.
Oct. 12, 1948.

IF WINTER COMES

The Wandsworth and District Gas Company recently co-operated with the Granada Cinema, Tooting, in a successful " tie-up " with the film " If Winter Comes." Attractive displays of coke and gas fires with film notices and photographs were displayed in the gas showroom and the cinema foyer.

A feature of the campaign was a Limerick competition, publicized in the local Press, in which competitors were invited to furnish a last line extolling the advantages of the gas-ignited coke fire. Coke fires were awarded as prizes for the best three lines, selected from over 300 entries. The limerick with the winning line was:

" If Winter Comes "—and it will,
Mr. Therm protects from all ill,
The home that acquires,
Gas-ignited coke fires,
Has less labour, less chill, and less bill.

Miss Christine Norden, the film actress, made a personal appearance at the cinema before a crowded and enthusiastic audience to present the prizes to the successful competitors, while from the " back cloth " a 12 ft " Mr. Therm " gave his benign blessing to the proceedings.

Diary

Oct. 21.—**Midland Association of Gas Engineers and Managers:** General Meeting, Queen's Hotel, New Street, Birmingham, 2.30 p.m.

Oct. 26.—**Southern Association of Gas Engineers and Managers:** Annual General Meeting, Connaught Rooms, 2.30 p.m. (preceded by Council, 11 a.m.).

Oct. 28.—**Solid Smokeless Fuels Federation:** Executive Committee, Dorchester Hotel, Park Lane, W.1, 11.30 a.m.

Oct. 29.—**Coke Oven Managers' Association:** Annual Dinner, Waldorf Hotel, London, W.C.2, 7 p.m.

Oct. 29.—**Manchester District Association of Gas Engineers:** Autumn Meeting, Hotel Majestic, Harrogate.

Oct. 29.—**London and Southern Junior Gas Association:** "The Preservation of Gas-works Structures by Paint," L. A. Ravald, M.Sc.(Tech.), A.R.I.C., Gas Light and Coke Company. Gas Industry House, 7 p.m.

Nov. 2.—**National Federation of Gas Coke Associations:** National Technical Committee, Coventry Gas Department, Gas Street, Coventry.

Nov. 3.—**Manchester and District Junior Association of Gas Engineers:** Morning—Visit to Sutcliffe Speakman & Co., Ltd., Leigh; afternoon—Visit to Rochdale Corporation Gas Department. "Coke and Breeze Briquetting," Mr. Bardsley (Sutcliffe Speakman & Co., Ltd.).

Nov. 8.—**London and Counties Coke Association:** Technical Committee, 2.30 p.m., Gas Industry House.

Nov. 9.—**Federation of Gas Employers:** Central Committee, Gas Industry House, 11.30 a.m.

Nov. 9.—**Chemical Engineering Group (Society of Chemical Industry):** "Heat Transfer," A. D. Davidson, Geological Society Rooms, Burlington House, Piccadilly, 5.30 p.m.

Nov. 10.—**Eastern Junior Gas Association:** Visit to Ascot Gas Water Heaters, Ltd., Neasden.

Nov. 10.—**Domestic Development Committee:** Technical Sub-Committee, Gas Industry House, 10.30 a.m. Meeting of Domestic Development Committee, 2 p.m.

Nov. 12.—**Eastern Association of Gas Engineers and Managers:** Autumn Meeting, Waldorf Hotel, Aldwych, London, 2.15 p.m., preceded by luncheon at 12.30 for 12.45 p.m.

Nov. 15.—**London and Counties Coke Association:** Annual Luncheon, 1 p.m. for 1.15 p.m.; Annual General Meeting, 2.45 p.m. Grosvenor House, Park Lane, W.1.

Nov. 16.—**Institution of Chemical Engineers:** "Chemical Plant Design for Ease of Cleaning," J. Matthews, B.Sc., A.R.C.S., Geological Society Rooms, Burlington House, Piccadilly, 5.30 p.m.

BRITISH JUNIOR JOINT COUNCIL

The Annual Meeting of the British Junior Gas Associations' Joint Council was held at the Royal Victoria Hotel, Sheffield, on Sept. 24. Mr. **W. T. Hird,** President of the Yorkshire Association, was Chairman. Representatives from the following Associations were present: Eastern, London and Southern, Manchester and District, Midland, Northern, Scottish (Eastern District), Scottish (Western District), Wales and Monmouthshire, Western, and Yorkshire.

The report of the Chairman of the Executive Committee was given by Mr. **F. W. Sansom,** of Exeter, in which he outlined the year's activities.

The Educational Report was given by Mr. **E. T. Pickering** (Birmingham), who reviewed the important steps taken by the Institution in adopting a new Education Scheme. He outlined the work of the District Education Committees, and showed how the Junior Associations were able to assist in that work. Among the various matters which the meeting discussed was the question of fees paid to lecturers in gas subjects at technical colleges throughout the country. A marked lack of uniformity was noticed, and it was felt that in many instances the fees offered were inadequate, and unlikely to attract the right type of person to part-time lecturing.

One of the most important items on the agenda was the election of the newly constituted Northern Junior Gas Association to membership of the Joint Council. This was proposed by Mr. **F. Bell** (Liverpool), seconded by Mr. **S. G. Meade** (Newport), and carried with acclamation.

The **President,** in welcoming the Hon. Secretary of the Northern Association, Mr. L. M. Weldon (Hartlepool), to the Joint Council pointed out that the whole of Great Britain was now covered by 10 Junior Gas Associations, each one of which was affiliated to the Joint Council.

Mr. **Weldon** expressed his pleasure at the warm welcome he had received.

The Transaction Secretary, Mr. **J. A. W. Stretton** (Coventry), presented his report on the work done in producing the 1946-47 edition of the Transactions, and outlined proposals for producing the 1947-48 edition. He believed that the Junior Associations were the first body connected with the gas industry to resume publication of their Transactions since the end of the war.

Mr. **W. F. Pritchard,** Hon. Secretary-Treasurer, presented the statement of accounts, which showed that the finances of the Joint Council were in a very healthy state.

A long discussion took place concerning the future, and it was unanimously agreed that the Junior Associations should endeavour to continue, as in the past, to further the knowledge and advance of the technical qualifications of the students and junior engineers, on whom the future of the industry would largely depend.

The following officers were unanimously elected to serve for a period of two years:

Educational Representative; E. T. Pickering.
Transactions Secretary; J. A. W. Stretton.
Hon. Secretary and Treasurer; W. F. Pritchard.
Chairman of Executive Committee; G. G. Warne.*
Vice-Chairman of Executive Committee; W. T. Hird.*

* The Chairman and Vice-Chairman of the Executive Committee do not take office until June, 1949.

Hon. Auditors; G. E. Banks (Yorkshire) and T. W. Pickthall (Manchester) were re-elected to serve for the ensuing 12 months.

It was decided to hold the next meeting of the Joint Council in Wales, and Mr. **A. H. Dyer** (Newport, President of the Wales and Monmouthshire Association) was duly elected President of the Joint Council for the ensuing year.

At the conclusion of the business meeting a hearty vote of thanks was accorded to Mr. W. T. Hird, the retiring President.

Entertainment for the delegates attending the meeting was provided by the Sheffield and District Gas Company. Mr. **R. Halkett,** General Manager and Chief Engineer, welcomed the delegates to Sheffield at an informal dinner, held on Thursday evening preceding the meeting, while on the Friday evening, after the conclusion of the business meetings, the delegates again found themselves the guests of the Sheffield Company at a performance of the "Merry Widow" at the Lyceum Theatre.

News in Brief

The Newcastle Branch of Cox and Danks, Ltd., has moved into larger offices. The new address is: Cox and Danks, Ltd., Commercial Union Buildings, 47, Pilgrim Street, Newcastle-upon-Tyne, 1. Telephone: Newcastle 20685-6 (unchanged).

An Extraordinary Meeting of the Dunstable Gas and Water Company is to be held on Oct. 26 to consider a resolution that the water undertaking, as well as the gas undertaking, shall be transferred to the Eastern Gas Board, and that notice to this effect be served on the Minister of Fuel and Power.

Arising From Recent Increases in the price of coke oven gas, which is now double the price paid by the Board before the war, the Ministry of Fuel and Power has issued a permit authorizing the Wath, Bolton, and Thurnscoe Gas Board to increase the price of gas by 3d. per 1,000 cu.ft. or 0.6d. per therm.

At the Invitation of the Yorktown (Camberley) and District Gas Company an instructional talk was given to their personnel at Camberley recently by Mr. Ean Andrew, Technical Representative of Main Water Heaters, Ltd. The talk covered the full range of post-war instantaneous and storage heaters and circulators which the Company is now producing, and was illustrated by sectional models, parts, and drawings.

A List of Prize Awards made by the Council of the Society of British Gas Industries in connexion with the recent examinations of the City and Guilds of London Institute, published in the "JOURNAL" of Oct. 6, included the name of R. T. Hobden, who was described as "of the Derby Gas Company." Mr. Hobden is, in fact, on the staff of the Long Eaton Gas Company, and was registered with the Derby Technical College for the examination.

After Many Years of exclusion from housing estates erected by the local authority, the Eastbourne Gas Company has been successful in obtaining an order to install gas services and carcass to cooker and copper point in each house of a new estate comprising 80 houses to be built by the Eastbourne Corporation in the Hampden Park area of Eastbourne. This installation will in each case be additional to a similar installation to be installed by the Electricity Authority, the approximate cost of both gas and electrical services averaging about £9 per house.

Representatives of the Southampton Gaslight and Coke Company attended a meeting of the Southampton Publicity Club to hear Mr. Leslie Hardern describe the public relations organization and activities of the Gas Light and Coke Company. Stressing the importance in an undertaking serving a population of five millions of keeping in the closest touch with the leaders of public opinion, Mr. Hardern told how the work of his department was divided into seven sections: public contacts, information service, advertising, Press, publications, films and facilities, displays and exhibitions. He described how the public relations magazine, *Modern Living*, revived in 1947, has achieved a paid circulation of 275,000 copies, and how the film "Behind the Flame" was being shown to the staff of the Company and a quarter-of-a-million consumers in 1948.

DEVELOPMENT PROBLEMS IN THE OXFORD AREA

NEEDS OF THE NEXT DECADE

WHATEVER may be the ultimate decision on the Oxford and District Gas Company's proposal to extend its present works—a matter on which we do not propose to comment while the application for a Special Order is still under consideration at Ministerial level—it cannot be questioned that the development of gas supplies in what, under the Gas Act, will become the northern part of the Southern Area Gas Board's territory is a matter of urgent importance. A greatly increased volume of gas must be made somewhere in that part of the country, not only to satisfy present demands but to keep reasonable pace with industrial, commercial, and domestic requirements in the predictable future.

It is fitting that until nationalization becomes an accomplished fact individual undertakings should persist in their endeavours to keep abreast of demand, and where, as in the case of Oxford, the trend is towards greater integration the industry has a strong case for proceeding as expeditiously as the supply position will permit with its planning for the installation of additional gas-making and distribution plant. That an early increase in gas-making capacity is needed is not in dispute; Oxford's issue is, we think, purely a question of siting, having regard to modern town and country planning considerations.

One of the objects of the Special Order, the application for which was the subject of a public enquiry which aroused country-wide interest last May, is to give effect to an agreement made between the Oxford Company and the Wantage Urban District Council last year for the transfer to the Company of the Wantage gas undertaking on terms set out in a schedule to the Order. The consideration for the transfer is put at £20,000, less the amount of instalments of principal and interest on loans accruing at any time between Mar. 31, 1945, and the date of transfer and paid or drawn by the Council out of the receipt of the Wantage undertaking; the amount paid by the Council by way of interest on any temporary loan whether incurred by way of an overdraft from a bank or otherwise after Mar. 31, 1945; the amount (not exceeding £400) expended by the Company in managing the Wantage undertaking from April 1, 1946, until the date of the transfer. The proposal arises from a request made by the Wantage Council towards the end of the war that their undertaking should be acquired by the Oxford Company. There is no question of an encroachment by the Oxford Company on its own initiative. As a matter of fact the Wantage works has been closed down and Wantage receives all its gas requirements by high-pressure main from Oxford.

The second important matter proposed in the Order is the enlargement of the Company's limits of supply by adding a number of parishes. Although in point of measurement the territorial extension is considerable, by far the greater proportion of gas produced will still be sold within the City of Oxford and its immediate environs.

Increase of Capital

Next, the proposed Special Order deals with increase of capital made necessary by the proposal for the extension of the gas-works. The Order provides for additional capital not exceeding £500,000 by the creation of new Ordinary stock or Preference shares or stock, or partly by one or other of those methods. The original power to borrow was limited to 60% of the amount of issued capital; under the new Order it is to be raised to 75%, not only on the new stock issued, but it raises by 15% the power to borrow on the earlier issued stock. The section of the Order which aroused opposition was the proposal to raise the gas-making capacity of the present works from 8 to 12 mill. cu.ft. per day, at an estimated cost of £726,100. If the additional plant were erected on an alternative site the cost would be about £1 mill.

In the course of the enquiry other alternatives were mentioned. It was pointed out that there were only three places from which the urgently needed additional gas could be brought—Reading, already working to capacity; Aylesbury, only now beginning to set in motion the request for powers to construct new works; and Swindon, 30 miles away, where supplies would be impossible short of undertaking new construction.

The Oxford and District Gas Company was incorporated 130 years ago, and its progress has been consistent throughout its long history and more especially since the turn of the century. In 1900 the annual output of gas was 300 mill. cu.ft., and the rate of output grew not, rapidly but steadily, until the outbreak of the 1914-18 war, when it reached about 450 mill. cu.ft. After that war the rise was steady right up to 1938, 1939, and 1940, when the rise was exceptionally rapid owing to wartime conditions—*i.e.*, the influx of evacuees and an increase in industrial activity. There was a small setback towards the end of the first world war, and a very slight setback occurred in the latter stages of the 1939-45 war.

By 1947 the annual output had reached 1,908 mill. cu.ft. and it is estimated that the figure will reach 2,300 mill. cu.ft. by 1956.

The following table shows the output of gas and the maximum and minimum days' output for eight years.

Year	Annual output, mill. cu.ft.	Percentage increase over 1939	Maximum day, mill. cu.ft.	Minimum day, mill. cu.ft.
1940	1,489	13.3	5.8	3.0
1941	1,769	34.6	6.5	3.4
1942	1,779	35.4	6.9	3.6
1943	1,742	32.6	6.3	3.4
1944	1,831	39.3	6.7	3.7
1945	1,830	39.3	8.0	3.4
1946	1,882	43.1	7.6	3.5
1947	1,908	45.1	8.9	3.3

In 1927 when the total output for the year was 858 mill. cu.ft the maximum weekly output was 21.5 mill. cu.ft. and the maximum daily output was 3.2 mill. cu.ft. In 1937 the corresponding figures were 1,257 mill., 32.5 mill., and 5 mill., and in 1947 they had reached 1,908 mill., 55.8 mill., and 8.9. mill. cu.ft. respectively. In the 10-year period 1927-37 the average rate of increase was 40 mill. cu.ft., and from 1937-47 it was 65 mill. cu.ft. In 1927 the storage capacity was equivalent to 26 hours of maximum daily output of gas; in 1937 it was down to 19 hours, and in 1947 to 11 hours. A 4 mill. cu.ft. holder which is included in the extension scheme would raise the storage to 22 hours of the present maximum day's output, and 18 hours of the estimated maximum in 10 years' time.

Prior to 1924 the area of supply of the Oxford Company was limited more or less to the City boundaries, but in that year the area was doubled, extending from Shipton Cherwell in the north to Wheatley in the east, Nuneham Courtenay in the south, and Cumnor, Cassington, and Bladon on the western side. A further large extension was authorized in 1930 when Oxford acquired its first outside undertaking —Abingdon, an area which in the first year took 31.4 mill. cu.ft. of gas from Oxford (or 3.2% of the total output), and 152.1 mill. cu.ft. in 1947 (8.0% of the total output) showing an increase of over 365%. A high-pressure main was laid to the site of the Abingdon works and gas manufacture there was discontinued.

More Extensions

Two years later—in 1932—a further extension was made to Didcot and a small area at Holton, adjoining Wheatley, on the eastern extremity of the area, was also added. Formerly there was a small undertaking at Didcot owned by the Great Western Railway, and used for supplying gas for its own purposes and for the benefit of railway employees. The Oxford-Abingdon high-pressure main was extended to Didcot and the local works was closed down. In the first complete year Didcot took 10.1 mill. cu.ft. of Oxford gas, or 1% of the total output, and last year the area took 77.4 mill. cu.ft., or 4.1% of the total output, an increase of 666%. Bulk supplies to the South Midland Gas Corporation, which began in 1935 with a total of 14.4 mill. cu.ft. (1.2% of the total output) rose last year to 114.5 mill. cu.ft. (6.0% of the total output).

An analysis of the Oxford Company's gas sales over the past 17 years shows that whereas in 1930 93.8% of the gas was sold within the City and only 6.2% in the outer area, last year 68.5% was sold within the City, 25.1% in the outer area, and 6.4% in the form of bulk supplies.

Proposals now before the Ministry of Fuel and Power provide for increasing the area of supply from 150 to 300 sq. miles, and incidentally wiping out a good deal of " no man's land " all round the present area. Before nationalization became a definite prospect there were proposals for extending the area to embrace Wallingford Urban District, and also Goring, but the nationalization plans have caused those proposals to be shelved.

The South Midland Gas Corporation was formed and high-pressure mains were run from Oxford to Eynsham, where the local works was closed down and the site utilized as a holder station. Similarly Witney and Woodstock are supplied in bulk from Oxford. Witney, Eynsham, and Banbury are South Midland Corporation undertakings, but not Woodstock, where the undertaking is owned by the Woodstock Power Syndicate, Ltd. The pre-nationalization plan envisaged the creation of a total Oxford area of some 500 sq. miles, taking in all the undertakings mentioned, as well as the Bampton Company (which has now been taken over by Swindon), and the Adderbury, Charlbury, and Bicester undertakings of the United District Gas Company, the Chipping Norton Gas Light and Coke Company, the Thame Gas and Coke Company (one of the United Kingdom Gas Corporation's Aylesbury-Leighton Buzzard Group), and the Wallingford and Wantage municipal undertakings. It was intended that high-pressure mains should be laid to convey gas to all the outlying areas.

As we have already said, under the new area set-up Oxford will become part of the territory administered by the Southern Area

Gas Board, which covers the whole or part of no fewer than 11 counties and will take in 56 undertakings. Oxford is the fourth largest of them. The present manufacturing plant at Oxford is so overloaded that no additional gas-consuming appliances are now being fixed unless they are absolutely necessary to the life of the community. This restriction is likely to remain in operation until new manufacturing plant is available.

It may be recalled that the Heyworth Report called attention to examples of undertakings whose sales expanded substantially as a result of war conditions between 1938 and 1944, and of nine undertakings cited, ranging from Manchester with an increase of 30% to Wolverhampton with an increase of 71%, Oxford came sixth with an increase of 50%. It is anticipated that gas consumption over the next five to seven years will normally increase at an average rate of 3% per annum.

The average number of houses to be erected by the Oxford Corporation in the next 10 years has been estimated at 500 a year. So far as the suburbs are concerned, known estates are likely to develop 733 houses in the same period, to which must be added long-term and private enterprise development, making a total of not less than 1,000 houses. New housing is expected to need a total increase of 121 mill. cu.ft. of gas over the 10-year period, of which 77 mill. cu.ft. will be wanted within the City, 27 mill. cu.ft. in the suburbs, and 17 mill. cu.ft. in the rural belt. Domestic development (overtaking arrears of supplies of gas appliances and so forth) is expected to require a like increase, comprising 77 mill. cu.ft. in the City, 28 mill. cu.ft. in the suburbs, and 16 mill. cu.ft. in the rural belt.

There is evidence of increasing demands for gas for central heating, domestic, commercial, and other purposes. Commercial development—*i.e.*, bread baking, central heating, &c., will require a further 52 mill. cu.ft. (all within the City), and industrial development a further 90 mill. cu.ft. (also all within the City). Oxford's industrial load is not large, being not more than 15% of the total. Morris Motors take about 50 mill. cu.ft. per annum, and the Pressed Steel Company about 200 mill. cu.ft. It must be remembered that the Morris works at Cowley are devoted almost entirely to assembly work, and that the main heat processes are carried out in the Birmingham area.

There are also "social services"—schools, canteens, libraries, &c.—and the colleges, which are expected to take another 36 mill. cu.ft., making an accumulated increase of 420 mill. cu.ft., or 22.0% over the 1,908 mill. cu.ft. sold last year. A minor, but possibly highly important, load is that supplied to the Atomic Research Station at Harwell, for purposes which are as secret as the atomic investigations themselves.

Modern Showrooms

The Oxford Company is fortunate in having modern, spacious showrooms in the centre of the City in St. Aldates Street, two features of which are the demonstration room, with accommodation for audiences of up to 200, equipped with the most up-to-date facilities for film projection and cookery demonstrations, and the homecraft centre on the first floor, which is proving a great attraction to so many Oxford brides-to-be that there is a waiting list. Miss Marguerite Narracott, the Company's Home Service Adviser, devotes her attention to both these departments. The idea of giving prospective brides elementary lessons in home management was first given practical application during the war, when a small alcove in the ground floor showroom was set apart for informal consultations. More recently a light and airy room upstairs has been equipped with six of the latest all-enamelled gas cookers and six enamelled-top tables, together with demonstrator's equipment, gas wash boiler and washing machine, clothes drier, and other appliances. Ventilating hoods are fixed over the cookers and air extraction fans in the outer walls ensure that no odours from the cooking penetrate to other parts of the premises. Groups of up to 20 young ladies take a course of 12 lessons, and those who show conspicuous ability are rewarded with certificates.

It is interesting to recall a paper which Mr. W. E. Caton, then General Manager and Engineer of the Company, presented to the 1929 meeting of the Institution of Gas Engineers, under the title of "Construction of Complete New Gas-works at Oxford, with Costs and Working Results over 18 months." Between 1914 and the date of Mr. Caton's paper the Company recorded an increase in ordinary consumers of 43%; in power and manufacturing consumers of 70%; and in prepayment consumers of 28%. Increases in consumption were 33% ordinary, 322% for power and manufacturing, and 106% for prepayment domestic consumers. The winter loads of 1924 and 1925 taxed the manufacturing resources of the Company to the limit in spite of the installation of carburetted water-gas plant in 1919.

The then new works which Mr. Caton described was laid out for an ultimate daily capacity of 8 mill. cu.ft. (of which 4 mill. was to by coal gas and 4 mill. carburetted water-gas). It is not without significance to recall that the total cost of the scheme was £105,116 compared with the three-quarters to one mill. pounds proposed to be spent on the further extensions proposed under the new Special Order.

Since that time Mr. Caton has been succeeded by Mr. Alexander Tran, who from 1919 to 1927 was in the Glasgow Corporation Gas Department. He then went to Helensburgh as assistant to Mr. David Fulton; from 1931 to 1934 he was Assistant Engineer and Manager at Coatbridge; from 1934 to 1938 Assistant Engineer and Manager at Bath; and from 1938 to 1940 Assistant Engineer and Manager at Reading. He then went to Oxford as Engineer and Manager, and was shortly afterwards appointed General Manager and Chief Engineer. Mr. Tran is also a Director and General Manager and Chief Engineer of the South Midland Gas Corporation, which has its head office in the same premises as the Oxford Company's showrooms in St. Aldates Street, Oxford.

CHEMICALS AND NATIONAL RECOVERY

Mr. Harold Wilson, President of the Board of Trade, was the principal guest at the annual dinner of the Association of British Chemical Manufacturers at Grosvenor House, Park Lane, on Oct. 13. Among others present were Colonel H. C. Smith, Chairman of the British Gas Council; Dr. E. V. Evans, a Vice-President of the Association and past-Chairman of the Gas Research Board; Mr. J. Davidson Pratt, Director of the A.B.C.M. and Chairman of the British Road Tar Association; Major T. Knowles, Coal Tar By-Products Control; Mr. A. Hittinger, National Benzole Association; Sir Robert Robinson, President of the Royal Society; Sir Frederick Bain, President of the Federation of British Industries; and Dr. H. E. Watts, Chief Inspector of Explosives.

Sir **Harry Jephcott,** Chairman of the Association, proposing the toast of the guests, said the chemical industry had been called on to play its full share in the effort the country was making to regain economic freedom. Its duty was threefold—first to provide essential domestic needs; second to provide the essential chemical requirements of those industries the export value of whose manufactured products exceeded that of the chemical ingredients; and third, and only after meeting both the preceding requirements, to export to the maximum possible extent. The export of chemicals now stood at 155% by volume compared with 1938. Of the total chemical products sold at home or exported, and estimated in 1947 to have a value of £233 mill., almost 90% was produced in this country, or, excluding those chemicals which represented unavoidable imports since the elements were not to be found in this country, as for instance potassium salts, no less than 93% were manufactured within this country, and they were now planning to bring that up to 100%.

Those with administrative responsibility in the industry were constantly underpressure to advance, to find better and cheaper ways of making existing things, and to extend the frontiers of chemical knowledge and to discover still more products of value to our national economy. One of the industry's greatest difficulties, however, was the limitation of plant. To overcharge plant was commonly to court disaster, to reduce output and efficiency rather than increase them. The order books of plant manufacturers were full for months, sometimes year, ahead, and, to a considerable extent, with orders for plant for export.

An Immeasurable Contribution

Mr. **Harold Wilson,** responding, said the chemical industry was one of the industries playing the greatest part in our national recovery. It had made an enormous direct contribution to the export drive during the past year. In value the direct exports of the chemical industry had increased from £27,250,000 in 1938 to £40 mill. in the first half of 1948. The industry's indirect contribution to the export drive was immeasurable, and it was also contributing very largely to import saving. It had very great dollar-saving potentialities, and there were many important projects in hand at the present time which would eliminate a large amount of the organic materials imported from North America since the war.

In a period of necessarily severe restrictions of capital building, important dollar-saving chemical schemes had still gone on. And it was in the chemical industry that some of the most important war-time and post-war developments had taken place. All the developments, taken together, would represent a notable contribution to the solution of Britain's own balance of payments difficulties within the next four years, and would enable us to reduce the dependence of other European countries on dollar imports.

The chemicals development plan, therefore, formed an important item, along with the other major industrial development plans, in the four-year programme which H.M. Government had submitted to the Organization for European Economic Recovery.

Sir **Ian Heilbron,** President of the Chemical Society, in proposing the toast of the Association, suggested that ways might be sought to ensure closer contact between individual firms and for pooling information which was often in fact an open secret. He had observed a welcome change of policy in many firms with regard to the publication of scientific papers, but he still thought this trend could go further, with advantage to the individual firm and to the community. It did not often happen that an individual or a country was given a chance to make good lost opportunities, but to-day the door stood open for this country to establish on the production side the pre-eminent position to which her scientists' original discoveries entitled her. Having visited many parts of Europe and the Commonwealth, he was convinced that given resolute determination and real leadership there was no obstacle to our becoming one of the foremost producers of fine chemicals in the world.

Sir **Frederick Bain** replied, and paid tribute to the services which Mr. Davidson Pratt had rendered to the Association for many years.

TRADE EFFLUENT

A SUMMARY OF THE LEGAL POSITION

BY LESLIE F. STEMP, B.A., LL.B.,
Legal Adviser, British Gas Council

THE recent case in which Lord Brocket obtained damages against the Corporation of Luton in respect of the pollution of certain ornamental waters has emphasized the difficulty which many local authorities are experiencing in regard to their sewerage systems. These difficulties have been enhanced by the phenomenal increase in population in various areas which before the war were purely residential and semi-rural. At the same time, traders—including gas undertakers—are finding the problem of the disposal of trade effluent far from reaching a solution, and this is particularly true of gas undertakings which carbonize in the area of one local authority sufficient coal to provide gas for the inhabitants of an area much greater than the boundaries of that local authority.

Before the passing of the Public Health (Drainage of Trade Premises) Act, 1937, the law relating to the disposal of trade effluent was most unsatisfactory. The Rivers Pollution (Prevention) Act, 1876, while providing that sanitary authorities should offer reasonable facilities for the discharge of trade effluent into sewers, attached to that obligation so many qualifications that in practice it was always possible for a local authority which did not wish to accept the effluent to refuse to do so. It was only necessary for the local authority to allege that the effluent would be detrimental to their sewerage system or that the capacity of the sewers was inadequate to enable them to evade any obligation under the Act.

The Public Health (Drainage of Trade Premises) Act which was passed in 1937 was an attempt to assist traders to get rid of their manufacturing effluent and at the same time to protect local authorities from obligations with regard to the reception of that effluent which it would have been impossible for them in many cases to fulfil. The Act, like most compromises, was perhaps not enthusiastically received by either party; nevertheless it does represent a substantial advance in dealing with this problem and it is desirable that gas undertakings should have some knowledge of its provisions. The Act for the first time imposes a liability upon local authorities to receive into their sewers the trade effluent arising from an industrial process carried on within their area.

The Act relates solely to the discharge by a trader into the sewers of a local authority in whose area his works are situated. A trader has no statutory right to drain any liquid from a factory into the sewers of any local authority other than that in whose area his process is carried on. On the other hand, the right conferred upon the trader to discharge into the sewers by the 1937 Act applies to all the effluent produced in the course of any trade or industry and therefore extends to all the effluent resulting from carbonization at a gas-works, notwithstanding the fact that far more coal is carbonized than would be sufficient if the supply of gas was limited to the district of the local authority in charge of the sewers.

The discharge of trade effluent must fall into one of the three following categories:

(1) Discharge by consent of the local authority;
(2) Discharge in accordance with by-laws;
(3) Discharge of effluent of the same character as that which was discharged from the premises into a sewer at some time within a period of one year ended Mar. 3, 1937.

Each of these categories demands some comment.

(1) Discharge by Consent

The local authority may grant consent unconditionally or may attach conditions with regard to the nature or composition of the effluent, the maximum daily quantity, and the maximum rate of discharge. In addition, the local authority can impose as a condition any requirement which could have been made by by-law, such as the elimination of condensing water or of any constituent of the effluent which might either alone or in conjunction with other matter prove injurious or obstructive to the sewers or render the treatment of the sewage especially difficult or expensive. The local authority may also require a payment to be made by the trader in respect of the discharge. If the trader considers that any conditions prescribed are unreasonably onerous he has two courses open to him. He may appeal to the Minister of Health against any or all of the conditions, and these conditions may be modified by the Minister. Alternatively, the trader may request the Minister to call upon the local authority to make by-laws with respect to the discharge of trade effluent.

(2) Discharge in Accordance with By-Laws

Local authorities are authorized to make by-laws relating to the discharge of trade effluent, and where the trader is willing to discharge his trade effluent in accordance with these bye-laws no express consent of the local authority is necessary, subject to the giving of a Trade Effluent Notice to be mentioned later. If there is any reluctance on the part of the local authority to make by-laws, they can be required so to do by the Minister, and, as mentioned above, there is no reason why a trader or body of traders should not request the Minister to use the powers conferred upon him by the Act.

Any by-laws would require the confirmation of the Minister, who would no doubt insist upon conformity with the Model By-Laws which have been issued. As an example, reference may be made to the by-laws made by the Urban District Council of Turton, which contain the following among other provisions:

(*a*) Exclusion of condensing water.
(*b*) Elimination of—
  (i) solids in suspension in excess of 25 grains to the gallon, or yeast together with solids in suspension in excess of 25 grains to the gallon;
  (ii) grease or oil in excess of 10 grains to the gallon;
  (iii) tar oil in excess of 7 grains to the gallon;
  (iv) tar;
  (v) cyanide compounds.
(*c*) Temperature—not to exceed 110° F.
(*d*) Acidity or alkalinity— The *p*H value to be not less than 6 or more than 10.
(*e*) Payments.—Payments vary in accordance with the class of effluent, varying from ½d. per 1,000 gal. for Class A, to 6d. per gal. for Class D. Class E comprises trade effluent absorbing more than 100 parts by weight of oxygen per 100,000 from a solution of N/80 potassium permanganate (0.394 g. KMn04 per litre) at 26.7° C. (80° F.) in four hours. The payment for this class is a sum to be agreed between the trader and the Council " having due regard to the nature or composition and the volume " of the effluent.

[**Before agreeing any sum, undertakers would be well advised to consult the Liquor Effluent and Ammonia Committee of the Institution of Gas Engineers.**]

(*f*) Inspection chambers, manholes and meters.

(3) Effluent of the Same Character as that Discharged at some time within a period of one year ended Mar. 3, 1937

Traders are entitled to discharge, without the consent of the local authority and without compliance with by-laws, effluent of the same nature or composition as that which was lawfully discharged at some time within the period of one year ended Mar. 3, 1937. This right is subject to the following qualifications:

(*a*) The maximum daily quantity discharged in the 1937 period is not exceeded;
(*b*) The maximum rate of discharge in 1937 is not exceeded.

Any dispute arising with regard to these provisions may be referred to the Minister of Health, whose decision is final, except that on questions of law the Minister may, and if directed by the High Court must, state a case for the opinion of the High Court.

If in 1937 the discharge was made under an agreement providing for payments, the discharge will remain subject to these payments although the agreement may have expired.

The discharge should be from the same premises and into the same sewer as in 1937, but where that sewer has been closed the trader has the right to discharge subject to the same conditions into any substituted sewer.

Even in the case of a discharge under this paragraph the local authority is entitled to make stipulations as to the temperature of the trade effluent, its neutral character, and the provision and maintenance of inspection chambers, or manholes and meters.

No payments may be demanded in respect of a discharge under this paragraph except where a charge had been agreed in 1937. It is also important to note that even in cases where, owing to an alteration in the nature or composition of the effluent from that discharged in 1937, the consent of the local authority becomes necessary, no payment may be imposed if, and so long as, the quantity discharged on any one day does not exceed the maximum quantity discharged on any one day in the period of one year ended Mar. 4, 1937.

Trade Effluent Notice

Where a trader desires to discharge with the consent of the local authority, or in accordance with by-laws, a Trade Effluent Notice should be served upon the local authority. Where consent is necessary, the Notice is to be regarded as an application for such consent. Such a Notice should also be served in cases where the discharge is a continuation of the discharge in 1937, in order that the local authority may have notice that the discharge is being made and may, if they

desire, raise any question as to whether there is compliance with the provisions of the Act relating to such a discharge. The Notice should contain the following information:

(*a*) The nature or composition of the effluent.
(*b*) The maximum daily quantity proposed to be discharged.
(*c*) The highest rate of discharge.

Where it is required to discharge with consent or in accordance with by-laws, no discharge is to be made (failing agreement to the contrary) within a period of two months from the date of the service of the Notice. Within this period the local authority may specify the date upon which the discharge may commence and, where consent is required, the terms upon which that consent will be granted.

Agreements

The Act allows a wide scope within which agreements may be made between local authorities and traders. Such agreements may provide for the removal and disposal of substances produced in the course of the treatment of effluent.

The Act, or by-laws made under the Act, will have no effect upon agreements made before the date of the passing of the Act (July 1, 1937) or the making of the by-laws, as the case may be.

Any trader who discharges into any sewer must supply to the local authority when requested in writing so to do such plans of the pipe or outlet as he is able without expense to obtain and allow the local authority to make copies thereof. In addition, he must furnish the local authority with all such information as he can reasonably be expected to supply.

Where the trader claims that the discharge is a continuance of the discharge made in 1937 he must on being required so to do furnish the local authority with such information as he reasonably can as to the nature or composition and volume of the trade effluent discharged in 1937.

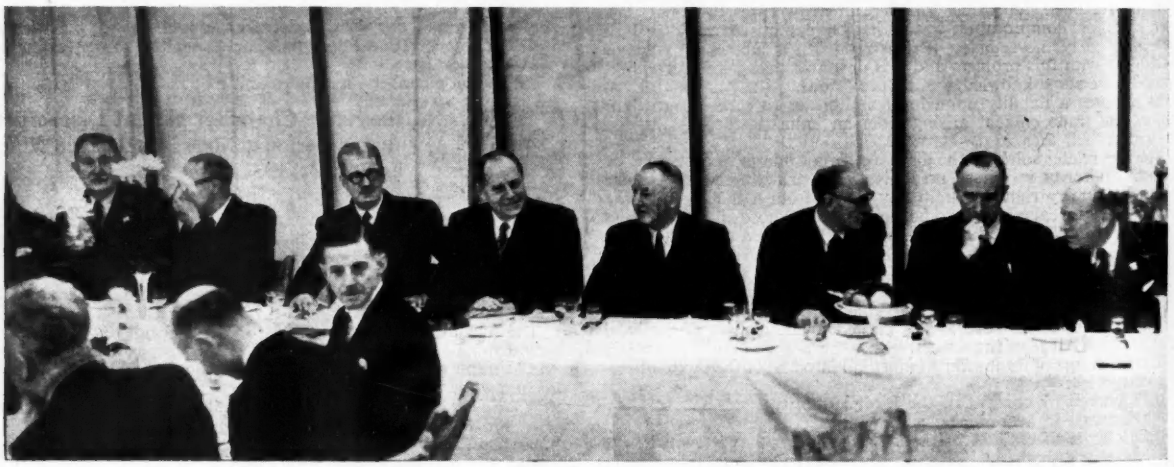
The local authority is also entitled to enter premises in order to obtain and take away samples of the effluent, but the results of the analysis of such sample shall not be accepted as evidence in legal proceedings unless the trader has been informed that the local authority proposes to have the sample analyzed and one part of the sample has been given to the trader in order that he may have an independent analysis made from the same sample.

MANCHESTER DISTRICT ASSOCIATION

VISIT TO THORNCLIFFE

MEMBERS of the Manchester District Association of Gas Engineers spent a most interesting day visiting the Thorncliffe Works of Messrs. Newton Chambers & Co., Ltd. on Oct. 8. The visitors were welcomed on arrival by Sir Harold West, Managing Director, and members of his staff.

Prior to the tour of the works the party was divided into four groups, each group being allotted to a bus; this commendable arrangement not only enabled the company to cover the vast area of the Thorncliffe works in comfort, but, which is most important during such visits, ensured the keeping of a definite timetable throughout the entire tour.



The top table at the luncheon included (left to right) C. S. Shapley (Leeds), N. G. Appleyard (Leeds), J. MacLusky (President), Sir Harold West, J. D. Ashworth (Blackburn), T. R. Cook (Blackpool), G. E. Currier (Bradford), and T. Reynolds (Stockport).

The very full programme arranged for the visitors included the inspection of the apprentice training centre for iron founding, structural engineering, mechanical engineering, and the works college for business training. Members also visited the foundry, the template shop and the constructional and heavy machine shops engaged in the manufacture of plant for the gas industry.

The Company is administered by a Board of Directors, of which Sir Samuel Roberts, Bt., is Chairman, and Sir Harold West Managing Director. Executive control is exercised by the Managing Director with the assistance of a Board of local Directors, over which he presides. In addition several committees sit to advise the Managing Director on technical and specialist matters.

Joint consultation between management and operatives exists through nine departmental committees with equal managerial and operative representation. These committees meet monthly to consider production and working conditions. The departmental committees report regularly to the Joint Production Advisory Council, which is constituted in the same way, and which, under the chairmanship of the Managing Director, meets monthly to discuss these matters on a Company level.

Two other factors in the promotion of good works relations are the activities of an honorary Works Relations Officer, a clergyman of outstanding ability and experience in social psychology, and a weekly works newspaper, the *Thorncliffe News*, whose function is to record all development and progress and to provide a means for quick circulation of news and views between departments.

Training and Welfare

Organized training applied at various stages and levels is being rapidly built up at Thorncliffe and is based on full initiation and instruction of all young persons entering the employment of the Company. From 1943 a "Works College," comprising training centres, has been in operation. These centres deal with business training (girls only) and apprentice courses for boys in engineering (foundry, constructional, and the lighter trades), painting and decorating, pattern-making and joinery, with other courses still to be added, the whole being under the direction of an Education Officer and a staff of instructors.

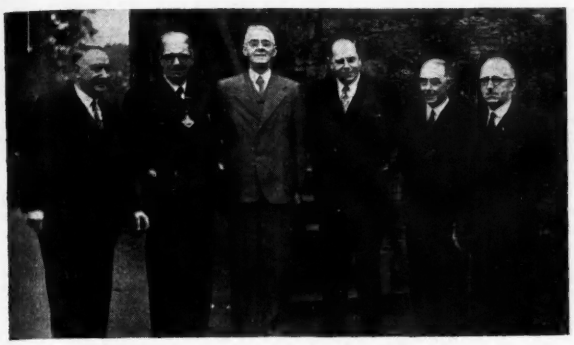
There is also organized instruction of supervisors on the lines of the "Training Within Industry" course and training in research in salesmanship and in other specialist activities. There are a Works Technical Society, works branches of the National Trades Technical Societies, and the Company offers facilities, bonuses and other forms of encouragement for individual technological study, from the local evening institutes upward through the technical colleges to the universities.

Welfare at Thorncliffe goes far beyond the statutory requirements of facilities for health and comfort. The Department is under the direction of a Welfare Officer, who takes account of such matters as health, safety, canteens, and recreation. Individual committees are responsible for the detailed organization of special interest and hobbies, such as music, drama, nature-study, photography, thrift,

horticulture, angling, physical training, literature, discussion, model-making, and other social and cultural activities. A Christian Fellowship meets weekly during the lunch hour.

A large recreational and sports ground within a few minutes of the works is now under construction.

Since the nationalization of the Company's colliery interests, activity is concentrated in two main divisions—engineering and chemicals. The engineering departments make heavy plant, particularly for the gas and steel industries, earth moving machinery for civil engineering, and stoves and grates, gutters and pipes, chiefly for the building trade. A recent development is the provision of corrosion-proof linings for vessels used in the food, brewing, and dairy industries. Production as diverse as this must necessarily be sectionalized.



Manchester District Association of Gas Engineers' visit to the Thorncliffe Works of Messrs. Newton Chambers & Co., Ltd. Left to right: J. D. Ashworth (Blackburn), Senior Vice-President; James MacLusky (Halifax), President; Bernard F. Brown, Regional Gas Officer (Northern), Ministry of Fuel and Power; Sir Harold West, Managing Director of Newton Chambers & Co., Ltd.; N. G. Appleyard (Leeds), Junior Vice-President; and T. Haworth (Wigan), Secretary.

The heavy construction division, with its foundries, machine, assembly and steel fabrication shops and erection squads, devotes itself to the building of gasholders, purifiers, condensers, and similar plant for gas-works and coke ovens; industrial blast furnaces and steel furnaces, ladles and bogies for the iron and steel industry; tanks and storage vessels in a great variety of shape and size for the oil industry; and heat-transfer equipment necessary to fuel economy in many industries.

Members of the Manchester District Association in the foundry.

The mobile engineering department is at present producing a type of mechanical excavator (under licence from the Koehring Company of Milwaukee, U.S.A.) known as the "N.C.K." excavator. The fabrication, machining, and assembly of these machines is concentrated at two points, a large welding shop where the blast furnace used to stand, and a new factory at Warren Lane away from the main works. This factory was designed and built shortly before the war for this type of engineering. Before it could be brought into excavator production it was taken over for "Churchill" tanks and was not available for its original purpose until the end of the war.

The light castings department concentrates on appliances for domestic heating and cooking, in addition to all types of builders' castings. In the foundry section is to be seen a mechanized moulding plant installed since the war and which is now in full production.

The "Ensecote" department provides corrosion-resisting linings for tanks, containers, and vessels of many kinds. The process consists of a thorough cleaning of the surface and the spraying and baking thereon of a specially prepared lacquer which eventually builds up a skin to protect the iron or steel underneath from the chemical action of the contents of the vessel. This process is transportable and vessels too large to be brought to the works can be treated and lined in customers' own premises.

The chemicals branch originated in the scientific processing of the oil products of coal. Newton Chambers' researches into this problem began over 60 years ago, and through a long series of experiments in coal carbonization a technique for the distillation and fractionation of coal-oils was developed. In the course of these researches, Izal oil was produced and, by emulsification, made available as a disinfectant of great germicidal power. To-day Izal is the "parent" of a large family of sanitary and hygienic products in fluid, powder, and medicated forms, including medicated paper and household disinfectants for which the demand is so great that a very large, highly mechanized factory has just been built at Thorncliffe to accommodate this business alone.

A number of service departments designed to meet the needs of the whole Company are incorporated in the central administration, notably traffic and transport, housing, estates, building and maintenance, power and water supplies, printing and stationery.

The visitors were entertained at lunch and tea by Messrs. Newton Chambers, Ltd.

INDUSTRIAL GAS CENTRE VISITS ROTHERHAM

The Yorkshire Industrial Gas Centre, following up the precedent occasioned by its visit to York and Harrogate in July, held a meeting of its Technical Panel at Rotherham Town Hall on Sept. 23, by invitation of the Rotherham Borough Council. An official welcome extended to members by the Mayor, Mr. C. Bosworth, was answered on their behalf by Mr. R. H. Anderson, Industrial Gas Engineer, Bradford Gas Department, and this year's Chairman of the Technical Panel. Following the meeting, members were invited to an official luncheon at the Town Hall, at which members of the Rotherham Borough Council were present, together with Directors of J. J. Habershon & Sons, Ltd., and Robert Jenkins & Co., Ltd., Rotherham.

Mr. **H. Shackleton,** Engineer and Manager of the Gainsborough Gas Department, proposing a vote of thanks to the County Borough of Rotherham on behalf of the visiting members, said they appreciated the hospitality offered to them. Special thanks were due to Mr. E. B. Field, Engineer and General Manager of the Rotherham Gas Department, and also to Mr. J. W. Holroyd, for the excellent arrangements made to ensure the day being a success. He also referred to the Yorkshire Centre, saying that it was an organization which had been formed many years ago to carry out research work and to develop the industrial uses of gas; a very important part of the Centre's activities being the work of the Technical Panel, at whose meetings the ideas and experience of members were freely interchanged. Finally, he paid tribute to past and present gas engineers at Rotherham, saying that according to the *Municipal Year Book*, Rotherham had developed rapidly in recent years, and this he felt sure was due to its live undertakings, among which gas had more than held its own.

Yorkshire Industrial Gas Centre at Rotherham. Left to right: R. H. Anderson, Industrial Gas Engineer, Bradford Gas Department, and this year's Chairman of the Technical Panel; Councillor F. Duke, Chairman of the Rotherham Gas Committee; C. Bosworth, Mayor of Rotherham; and E. D. Field, Engineer and General Manager, Rotherham Gas Department.

Councillor **F. Duke,** Chairman of the Gas Committee, replying for the Corporation, thanked Mr. Shackleton for his remarks and said that Rotherham had always endeavoured to move with the times. He referred to the progress made by the Gas Department during the last few years, and extended thanks to J. J. Habershon & Sons, Ltd., and Robert Jenkins & Co., Ltd., for providing the opportunity to inspect the gas-fired equipment installed at their works.

At the former works members showed great interest in the numerous processes carried out in connexion with the production of sheet steel, and at the latter works various sized articles were seen being treated in hot dip galvanizing baths.

The visit concluded at Rotherham Town Hall, where afternoon tea was served.

A NEW METHOD OF TESTING DRAUGHT DIVERTERS

By LOUIS COHEN, B.Sc., and

R. JESSEL, A.R.C.S., Ph.D., F.Inst.P., A.M.I.E.E.,

Ascot Gas Water Heaters, Ltd.

A NEW method of testing draught diverters is described in which all the air entrained by the heater is measured for various draught conditions in the secondary flue. The lower part of the heater is enclosed in an air-tight box so that all the air used by the heater is taken from this box. Air is supplied to the box by a fan, the output of which is adjusted to maintain the pressure in the box at atmospheric. The air flow is measured by a calorimetric flowmeter. The paper includes the results of experiments on the sampling of CO_2 in the primary flue and of temperature and pressure investigations in the secondary flue of a gas water heater. There is also a critical discussion of the previous methods of draught diverter testing.

Introduction

In the writers' experience the method of testing draught diverters, as laid down in B.S.S. 766, by the measurement of the CO_2 of the gases in the primary flue, is not one that gives consistent, reproducible, or necessarily significant results. The method uses the CO_2 content of the flue gases as a measure of the volume of products passing through the heater and the test attempts to show whether this quantity is changed radically by conditions in the secondary flue.

If the gas composition is unaltered during the test, comparison of the % CO_2 will be a measure of the volume of air passing, but if it changes then corrections will have to be applied based on the analysis of the gas. Under present-day conditions the composition cannot be relied upon to stay constant for any considerable time, and gas analysis is a long and tedious process.

Further, it is doubtful if a true sample can be taken in the primary flue because of the heterogeneity of the gases and also because various amounts of dilution can take place, depending on the positioning of the probe. The inconsistency of primary flue sampling was recognized by the B.S.I. Committee redrafting the combustion specification

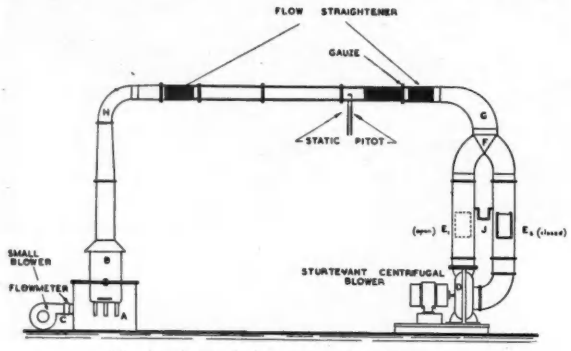


Fig. 1—General Arrangement of Apparatus.

B.S.S. 717, and they have rejected this method. It therefore becomes necessary to devise a method of test which does not use primary flue sampling and which is independent of CO_2 measurement.

In the method described in this paper the quantity of air supplied to the heater is measured directly and the test seeks to determine how this quantity varies with draught conditions in the secondary flue. The apparatus, and experimental procedure followed in doing this, are described and the paper also includes a discussion on the limits of the tests defined in B.S.S. 766 and makes suggestions for their amendment.

Apparatus

A general view of the apparatus is shown in Fig. 1. The lower part of the heater under test (B) is enclosed in a cubical airtight box (A) of edge 18 in. All the major apertures in the heater casing which are intended to admit air are within this box. Other fortuitous apertures not inside this box are sealed so that all the air entrained by the heater passes through the box. A set of removable lids is available, each with an aperture cut to suit a different type of heater. The gas inlet and the water inlet and outlet form a permanent fitting on the back of the box so that a heater may be set up for test with the minimum of trouble.

A small blower fan, the inlet of which has a throttle with a fine control, supplies air to the box through a 6 in. pipe. A calorimetric flowmeter C (fully described in the next section) measures the volume of air flowing in the inlet pipe. The air pressure differential between the interior of the box and the outside atmosphere is measured by a micromanometer which must be of high sensitivity and preferably direct reading. In these experiments an Ascot-Casella micromanometer was used.

To produce the necessary test conditions, a large blower fan (D) is connected to the top of the draught diverter under test. The connecting duct is in three sections, the first containing the valves E_1 and E_2 and change-over flap F. This leads, via the curved pipe G, to the straight measuring section, which is connected in turn to the draught diverter by another curved pipe. To produce an updraught in the secondary flue of the heater the lever J is brought forward, closing valve E_1 and opening valve E_2, and the change-over flap F moved to the position shown in Fig. 1. For a downdraught the two levers are brought into their reverse positions. The blower is driven by a variable speed motor which is controlled by a rheostat. At each end of the measuring section of the duct is a length of pipe containing a nest of $\frac{3}{8}$ in. copper tubes preceded by a fine mesh gauze. These act as flow straighteners and produce an almost uniform velocity distribution across the duct between them.

The draught velocity in the secondary flue is measured by a pitot-static arrangement in the measuring section. The total-head tube is made from hypodermic tubing held in a boss which allows the end of the tube to be directed to face the draught. The tube measuring the static pressure is flush with the surface of the duct, which is specially smoothed in that region. The velocity head (*i.e.*, the difference between

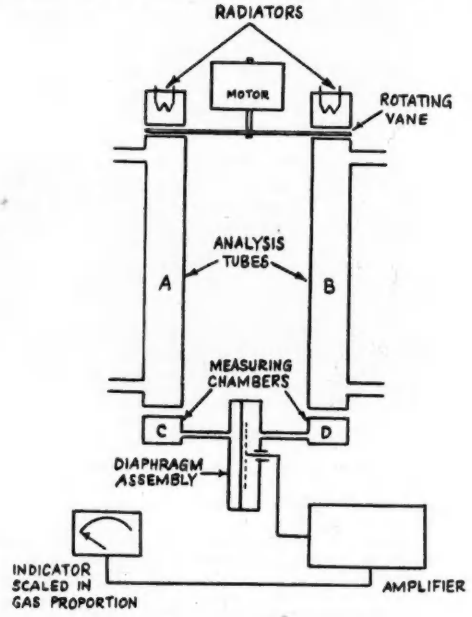


Fig. 2.—Infra-Red Analysis Apparatus.

the total head and the static pressure) is read on a micromanometer (reading to 10^{-3} in. W.G.) for low flows, and on an inclined plane water gauge (reading to 10^{-2} in. W.G.) for higher flows. The micromanometer used is an Ascot-Casella of reduced sensitivity.

Measuring Instruments

1. *The Calorimetric Flowmeter*

The principle of this flowmeter is to supply heat to the air at a constant rate and to measure the consequent rise in temperature differentially by a pair of platinum grids. The heating coil consists of a length of spiral electric radiator element which is pulled out and fixed to and fro along five chords so as to cover the area of the circular pipe as uniformly as possible. An extremely steady current is supplied from large batteries so that the heater dissipation is fixed within very

close limits. The thermometers, one on either side of the heater and some 4 in. from it, are made of 0.004 in. platinum wire and are similar in shape to the heater. To the end of one thermometer is soldered a short length of thicker platinum wire to facilitate the balancing of the two thermometers. It is necessary that they should be accurately the same resistance so that changes in the ambient temperature will affect them equally. The platinum wires are enclosed in thin glass tube which reduces their speed of response and makes them less susceptible to eddies, thus steadying the reading of the instrument.

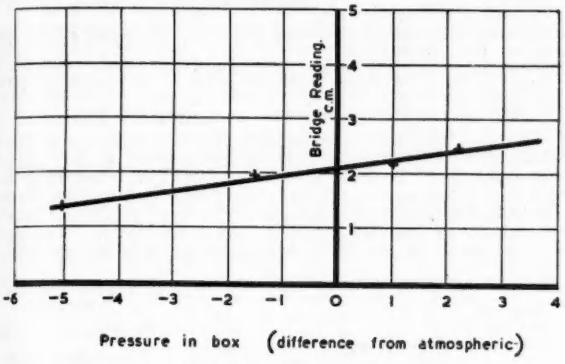


Fig. 3.— Effect of Pressure Difference in Box.

The change in resistance of the thermometers is measured directly by a Callendar and Griffiths bridge, balanced to the nearest centimetre and using the galvanometer deflection to estimate fractions.

The change of resistance gives the rise in temperature of the air when the temperature coefficient of resistance of the platinum wire is known.

The equation of the heat balance is then:

$$VC_pdT = W$$

where

- V is the volume flow of air,
- C_p its specific heat at constant pressure,
- d its density,
- T its temperature rise, and
- W the heat dissipated.

Inserting the appropriate values for the constants it is found for the flowmeter used that

Volume flow (cu.ft./min) = 74.7/bridge reading (cm.).

2. *The Micromanometers*

The micromanometer, which has been fully described by Hindley,* consists essentially of two bells with their mouths below a liquid surface and suspended from the beam of a torsion balance. The pressures are communicated to the interior of the bells and tilt the balance beam. The difference in the pressures in the bells is read on an illuminated scale without manipulation of the instrument. The response is rapid and the sensitivity is better than 10^{-4} in. W.G.

For the adjustment of the pressure in the box a standard instrument was used, with one bell left open to the atmosphere. For the lower sensitivity required in the total-head measurements an instrument was fitted with bells of approximately one-tenth the area so that the instrument was sensitive to 10^{-3} in. W.G. and its range was increased tenfold.

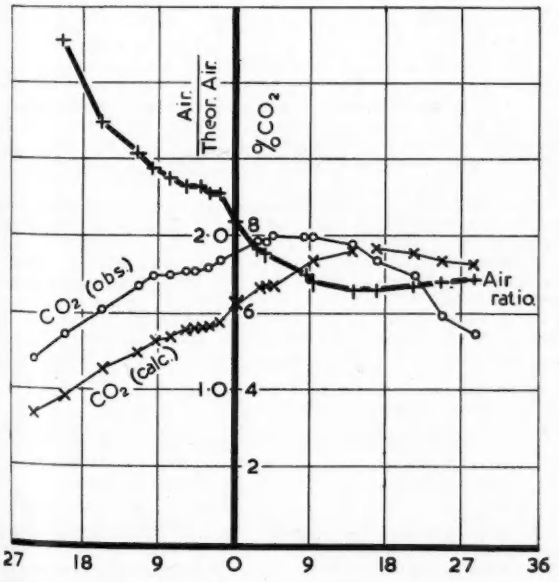


Fig. 4.—Results for Rectangular Diverter.

* Hindley, H. Rostron. J. Sci. Instrum. 24. p. 295 (November, 1947).

3. *The Infra-red Gas Analyzer*†

The instrument is shown diagrammatically in Fig. 2.

This is based on an instrument described by Luft‡ and is suitable for measuring small concentrations of CO or CO_2.

Two similar radiation sources pass beams through analysis chambers, one filled with gas under test and the other with air, and into the CO_1- or CO_2-filled measurement chambers behind them. Both beams pass through a chopper wheel driven by a synchronous motor which interrupts and passes them in the same phase giving pulses of radiation down the tubes. In the measuring chambers these intermittent beams, one weaker than the other because of absorption in the analysis chamber, are totally absorbed and give rise to increases in temperature and pressure of the enclosed gas, greater in one case than the other. The two measuring vessels are separated by a membrane condenser whose capacity depends on the displacement of the membrane, to one plate of which a steady voltage is applied. The potential of the other plate varies with the capacity of the condenser and these variations are amplified and fed to a suitable measuring instrument.

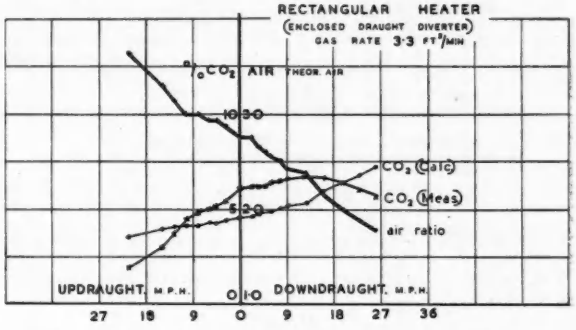


Fig. 5.—Results for Built-in Diverter of Rectangular Heater.

In these experiments two analyzers were used, one for CO having a full scale deflection of 0.2%, and the other for CO_2 with a full scale deflection of 10%.

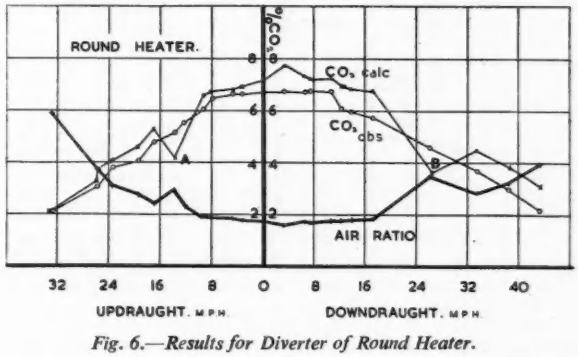


Fig. 6.—Results for Diverter of Round Heater.

For CO_2 measurement both the Haldane and the thermal conductivity type meters were also used, but these are well known and do not need description.

Procedure

The experimental procedure is to set the large blower to give a particular draught velocity (as measured by the pitot-static tube) in the secondary flue and then the throttle of the small fan is adjusted so that the pressure in the box is kept at atmospheric. With the fine control on the throttle and the very sensitive micromanometer it is possible to adjust the pressure in the box to be within 2×10^{-4} in. W.G. of atmospheric, and in these circumstances the presence of the box can be ignored as far as the combustion in the heater is concerned.

† The instrument used was manufactured by the Infra-Red Development Co.

‡ Luft, K. F. Z.Tech.Phys. 5 p.97 (1943). B.I.O.S. Final Report 532.

The flowmeter bridge and associated galvanometer are read, this reading giving the rate of flow of air into the box and hence the rate at which the heater is entraining air. This process is repeated for about 20 different draught velocities covering the range 30 miles per hour updraught to 30 miles per hour downdraught.

When comparison was made with the existing method of test, the CO_2 content of the flue gases was measured either by an infra-red CO_2 meter or by a meter of the thermal conductivity type. The sampling probe, made from ¼ in. tubing drilled with 1/32 holes at approximately ½ in. spacing, was normally placed at the top of the primary flue across a diagonal in the case of rectangular heaters or across a diameter in the case of round heaters.

Fig. 3 shows how the bridge reading varies with the pressure in the box. For an accuracy of 1% the bridge must be read to 0.05 cm. and the reading kept steady to 0.025 cm. In order to do this, it

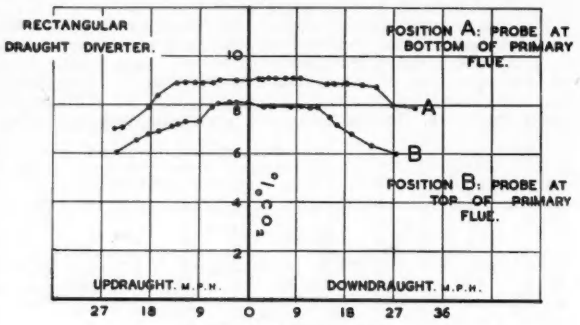


Fig. 7.—Effect of Dilution.

will be seen from the curve that the pressure must not differ from atmospheric by more than 2×10^{-4} in. W.G., which is just about the limit to which the pressure can be adjusted with the arrangement described.

Results

Some specimen results are shown in Figs. 4, 5, and 6, where Fig. 4 gives the results for a rectangular heater with an external draught diverter, Fig. 5 for a rectangular heater with a built-in diverter, and Fig. 6 for a round, sink-type heater.

In each case the curves drawn are:

(i) The ratio of the air entrained to the air required for theoretical combustion, which is the new method of presentation.
(ii) The % CO_2 as observed with a conductivity type meter, according to the existing standard method.
(iii) The % CO_2 calculated from (i) so that the two methods may be compared.

It will be seen that the % CO_2 observed curves in each case are of the shape normally obtained by existing test methods. This indicates

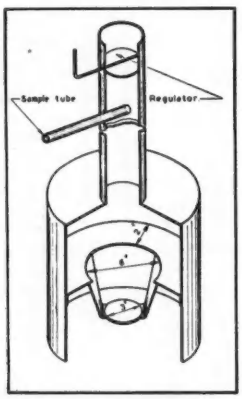


Fig. 8.—Sampling Hood for Water Heaters.

that the box has no effect on the performance of the heater, providing the pressure in its is maintained at atmospheric.

As the gas composition was not accurately known, too much reliance cannot be placed on the absolute values of the % CO_2 (calculated), but in the case of the rectangular heaters (Figs. 4 and 5) it will be noted that the % CO_2 curves (calculated and observed) differ in shape. In Fig. 4 the maximum on the % CO_2 (calculated) curve occurs at a higher velocity than that on the observed curve. In Fig. 5 the calculated % CO_2 rises steadily with increasing downdraught although the observed % CO_2 shows a definite maximum at approximately 12 miles per hour. This shows that a downdraught in the secondary flue causes a pressure build-up in the primary flue and prevents the free flow of flue gases through the heater, an effect which is entirely missed by the existing method of test, probably because dilution takes place at the probe. In a round heater the stream of flue gases is much more homogeneous than in a rectangular heater. Consequently Fig. 6 shows the best agreement between the observed and the calculated CO_2 curves.

By the new method of test two positions of marked instability are shown up (A and B, Fig 6) due probably to some resonance effect in the air columns, but they are not revealed on the % CO_2 observed curve.

Discussion

The discrepancies described can be attributed largely to sampling and are due principally to:

(i) Dilution of the gases by air entrained at the draught diverter hood.
(ii) The heterogeneity of the gases in the primary flue.

The effect of dilution at the primary flue may be seen from Fig. 7, which gives test results with the sampling probe in two different positions. In A, the probe is at the bottom of the primary flue and, as is to be expected, there is less dilution than at the top of the primary flue (B). Furthermore, the % CO_2 falls off more rapidly with increasing velocity of downdraught in B than it does in A. This again is to be expected, as the amount of air entrained at the draught diverter

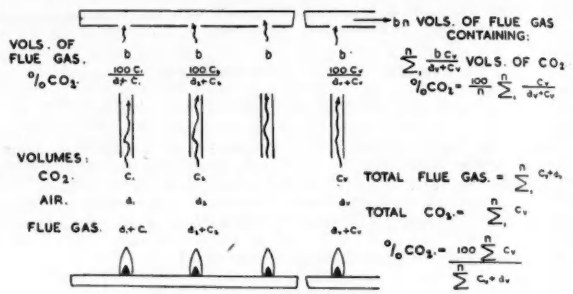


Fig. 9.—Calculation of % CO_2.

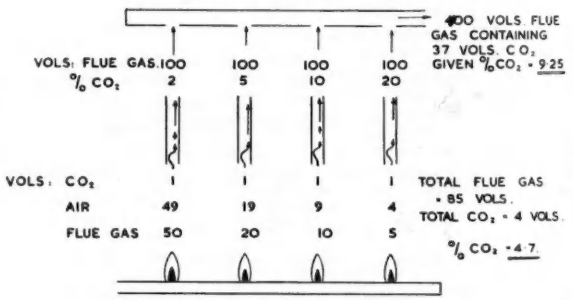

100 VOLS. FLUE GAS CONTAINING 37 VOLS. CO2 GIVEN % CO2 = 9.25
VOLS. FLUE GAS.
% CO2
100 2
100 5
100 10
100 20
VOLS: CO2 1 1 1 1
AIR 49 19 9 4
FLUE GAS 50 20 10 5
TOTAL FLUE GAS = 85 VOLS.
TOTAL CO2 = 4 VOLS.
% CO2 = 4.7

Fig. 10.—Numerical Example of Calculation of CO_2.

hood, and hence the spurious dilution, must increase with increasing draught velocity. The same effect of dilution at high draught velocities is visible in Figs. 4, 5, and 6.

The inadequacy of primary flue sampling with a multi-holed probe has been recognized in the redrafting of B.S.S. 717, which now recommends a sampling hood as shown in Fig. 8. The flue gases, after being mixed in the large chamber, pass through a pipe in which the flow is regulated so that spillage from the bottom of the hood is just prevented. The sample is drawn from the upper flue through an open ended tube. Table 1 compares the results obtained by this method and by sampling in the primary flue.

TABLE 1

(Rectangular draught diverter)

Position of sample	% CO_2	% CO	CO/CO_2
Primary flue	8.4	0.0045	0.0054
Sampling hood ..	5.0	0.0038	0.0076

To investigate this point further, the flue gases coming through a rectangular draught diverter were sampled at 48 places. The area of the primary flue was considered as an inch square grid and a sample drawn from the centre of each cell. The % CO_2 was measured by an infra-red meter. The distribution is shown in Table 2, and it will be seen that the measured values vary between 3.0% and 9.8%. This variation is due partly to the unevenness of flame pattern and partly to difference in the aerodynamic resistance of the heater body.

At the same time, a measurement of the % CO_2 in the primary flue by a multi-holed diagonal probe gave a value of 8.0%. By averaging the values of total air/theoretical air obtained from values of the measured % CO_2 and reconverting to CO_2, a true mean value can be obtained. For the data given above the value is found to be 7.0%.

The % CO_2 was also measured in a special primary flue in which the flue gases had been thoroughly mixed and the percentage was found to be 6.9.

In general the falsity of multi-holed probe sampling can be shown by considering Fig. 9. The total flue gas flow is considered as being made up of n columns. In any one, say the rth, there are c_r volumes of CO_2, a_r volumes of air and other products and therefore $a_r + c_r$ volumes of flue gas, so that the % CO_2 in the rth column is $\frac{100\ c_r}{a_r + c_r}$

The total CO_2 in the heater is $\sum_{r=1}^{n} c_r$; the total flue gas is $\sum_{r=1}^{n} (a_r + c_r)$: so the real % CO_2 for the whole heater is

$$\frac{100 \sum_{1}^{n} c_r}{\sum_{1}^{n} (a_r + c_r)}$$

If there is a sampling probe with n equal holes, each hole draws in the same amount of flue gas, say b volumes. If there is a one-to-one correspondence between the probe holes and the columns of flue gas, then the probe draws in bn volumes of flue gas containing $\sum_{1}^{n} \frac{b\,c_r}{a_r + c_r}$ volumes of CO_2. So that the % CO_2 as measured by the sample probe is $\frac{100}{n} \sum_{1}^{n} \frac{c_r}{a_r + c_r}$ which is different from

$$\frac{100 \sum_{1}^{n} c_r}{\sum_{1}^{n} (a_r + c_r)}$$

TABLE 2.—*CO_2 Distribution in Primary Flue*

Back

4.4	3.9	3.0	4.6	3.0	5.2	5.2	4.0
7.0	7.4	8.0	8.4	8.2	8.4	8.0	5.9
5.9	7.8	8.2	8.8	8.2	8.6	7.5	7.1
7.8	9.3	9.3	8.8	9.1	9.8	8.9	7.2
6.5	7.6	8.0	7.6	7.4	7.1	6.8	4.3
6.1	6.4	7.8	7.6	7.1	8.1	7.7	5.5

Front

Fig. 10 gives a simple numerical example of the general result with four columns considered. The fault of the multi-holed probe is that it is unable to weight the individual samples to give the true mean. The only satisfactory way of finding the overall combustion performance of the heater is to measure the total volume of CO_2 and the total volume of flue gas.

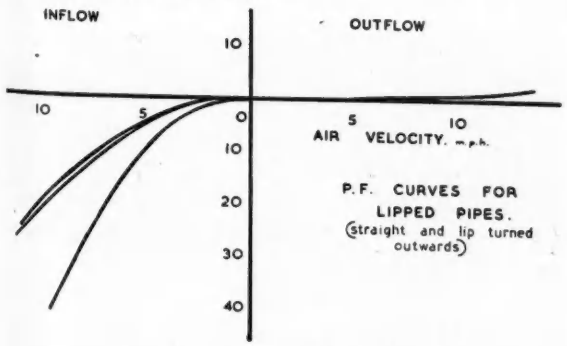


Fig. 11.—P.F. Curves for Lipped pipes.

The new test method avoids all these difficulties of sampling and can be used to calculate the true mean % CO_2. As a demonstration of this there follow the results obtained in an experiment to compare the value of the % CO_2 as calculated with the value measured. The % CO_2 and % O_2 were measured in a special primary flue in which the flue gases were thoroughly mixed. At the same time the air flow to the heater was measured, and from this value and a knowledge of the gas composition the % CO_2 was calculated. The measured and calculated values of the CO_2 are seen to agree.

Air Flow

Bridge reading = 2.79 cm.

Air flow $= \frac{74.7}{\text{Bridge reading}} = 26.8$ cu.ft./min.

Gas rate = 3.26 cu.ft./min.

Air for theoretical combustion = 3.26 × 4.55 = 14.8 cu.ft./min.

So $\frac{\text{Total air}}{\text{Theoretical air}} = \frac{26.8}{14.8} = 1.80.$

Using the fact that 1 vol. of gas requires 4.55 vol. of air for theoretical combustion, giving 4.25 vol. of dry flue gas, it can be shown that this dilution will reduce the CO_2 content to 0.54 of its maximum.

Flue Gas Analysis (*Haldane*)

% CO_2 = 7.0.

% O_2 = 9.7.

By "21 rule" maximum $CO_2 = \frac{21 \times CO_2}{21 - O_2} = \frac{21 \times 7.0}{11.3} = 13.0\%$.

So that the % CO_2 calculated from air flow = 0.54 × 13 = 7.0, which agrees with the measured value by flue gas analysis.

These results verify that the air-entrainment method does give the true combustion performance of a heater in a way that no sampling method can.

Furthermore, the measurement is entirely independent of gas composition and the interpretation depends only on the value of air required for theoretical combustion which varies little with changes in gas composition.

Test Limits

In these experiments the standard practice of measuring the velocity of the draught in the flue has been adopted, but so far no mention has been made of the test limits. The following remarks indicate how difficult it is to fix limits applicable to all systems of flues, but

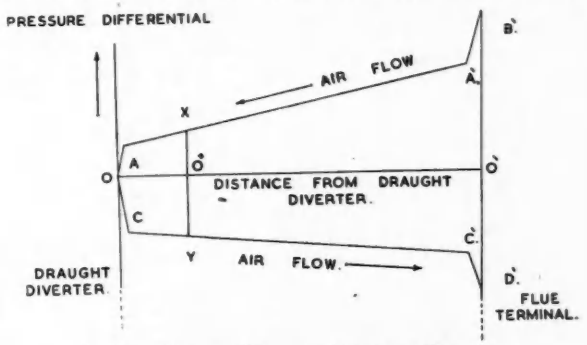


Fig. 12.—Diagram of Pressure Drops in a Flue system.

it is shown that the static pressure in the flue is a more convenient measure of the conditions than the draught velocity.

A given wind velocity determines the difference between the pressures at the two flue terminals, but the flow in the flue depends also on the diameter, length, and layout of the flue and on the aerodynamic characteristics of the flue terminal and the draught diverter.

Fig. 11 shows the entry pressure-flow characteristics of a family of bell mouthed tubes. It will be noted that there is in general a much greater resistance to entry than to emission of air. Consequently the pressure distribution in a complete flue system will be asymmetrical and will, in general, be of the form shown in Fig. 12. For air flow downwards the pressure (relative to the atmosphere near the heater) will be represented by the curve OAA′B′ when A′B′ is the pressure drop at the draught diverter exit. For reversed (upward) flow the entry drop at the draught diverter is OC, the drop along the flue CC′, and the exit drop at the terminal C′D′. For equal air flows in the two directions the slope of the lines AA′ and CC′ will be equal (and opposite).

The quantity which can be defined in terms of maximum wind conditions is the maximum total pressure differential O′B′ or O′D′, and for a given set of flues this will fix the limiting pressures O′′X and O′′Y or the limiting velocities in the flue pipe. The measurement of the static pressure is, however, considerably easier than the measurement of the air velocity which involves the production of a uniform velocity distribution in a special measuring section.

Fig. 13 gives the actual pressure flow curves applicable to a flue system.

The first curve (*a*) is for a typical draught diverter alone (multipoint water heater type). It will be observed that the curve is unsymmetrical for directions of flow, the flows being greater for the same pressure in a downdraught than in an updraught direction, as would be expected. The asymmetry is not very great, as a draught diverter of this type is effectively flared.

The next curve (*b*) shows the effect of adding to the draught diverter

a 4 ft. length of 5 in. diameter flue pipe, and in this case the flow pressure addition is symmetrical. The reason for choosing such a short flue will be explained later.

Curves (*c*), (*d*), and (*e*) show the effect of adding a terminal to the draught diverter and short flue. Curves (*c*) and (*e*) represent the limits of a number of commercial terminals tested, and it is of interest to note that little idea of their performance can be obtained by inspection of their shape. Curve (*d*) was inserted because it is a popular and much used terminal, the Ventile, and lies in the middle of the range. The range of overall flue characteristics lying between curves (*c*) and (*e*) is shaded for clarity.

Now the maximum wind velocity ordinarily encountered can be taken as 60 miles per hour and the maximum pressure that will be

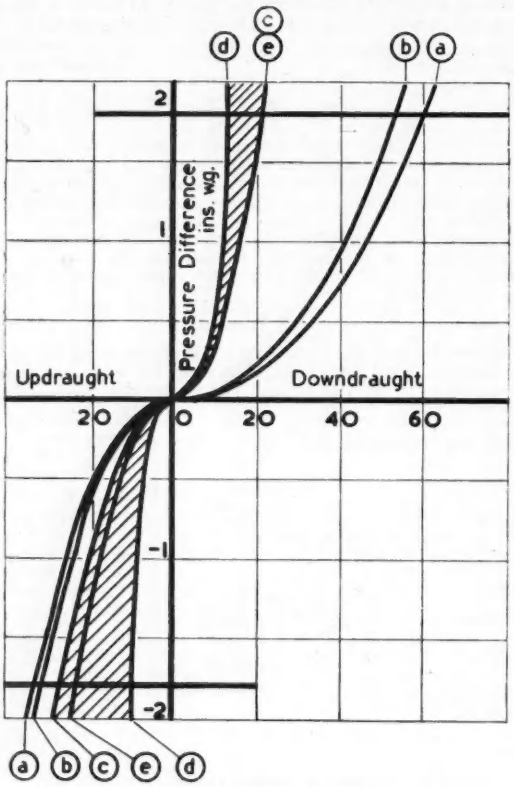


Fig. 13.—Curves for Flue Systems of Heaters.

developed by a wind of this velocity, the pitot pressure, is about 1.8 in. water gauge. Consequently, horizontal lines are drawn in Fig. 13 at 1.8 in. water gauge to represent the effects of a 60 miles per hour wind on the system. The horizontal ordinates are velocities on an arbitrary scale (of the order of miles per hour in the flue).

Now a draught diverter has to be tested independently of a flue system and it is therefore necessary to define a test condition which takes account of the worst (from the test point of view) flue system to which it is likely to be connected. Further, it is advisable to define this condition in terms of pressure difference within and without the draught diverter (which is fairly easy to measure) rather than in terms of flue velocity (which is extremely difficult to measure).

The pressure across the draught diverter alone corresponding to a 60 miles per hour wind is obtained by dropping a vertical line from the intersection of the flue system characteristic curve with the pressure (1.8 in. W.G.) corresponding to 60 miles per hour on to the draught diverter characteristic and then reading the pressure corresponding to this second intersection. In Fig. 13 on the downdraught side this pressure is:

With Terminal 3	..	..	..	0.05 in. W.G.
With Terminal 4	..	..	..	0.18 in. W.G.
With Terminal 2	..	..	..	0.18 in. W.G.

Obviously for test purposes the highest figure (with perhaps a margin) should be taken and a very small flue length was included above in order that the overall curves should lie as far to the right as possible and so give the highest test pressure limits. It is easy to see that, in the cases given, doubling the length of flue (or number of bends) would have reduced the draught diverter pressure corresponding to a 60-mile per hour wind by about one-third.

On the updraught side the disposition of the curves is rather different owing to the reversed nature of the asymmetry of the draught diverter and terminal characteristics, but the same procedure gives for the draught diverter pressures corresponding to 60 miles per hour wind:

With Terminal 3	..	..	..	0.13 in. W.G.
With Terminal 4	..	..	..	0.82 in. W.G.
With Terminal 2	..	..	..	1.12 in. W.G.

These updraught pressure drops look rather large, but in fact correspond to actual velocities in the flue below 30 miles per hour.

Measurements for many draught diverters and terminals should be taken before test limits are proposed in order to determine the most severe conditions. On the figures given, however, it would be reasonable to set draught limits as follows:

The static pressure differences between the inside of the draught diverter at the secondary flue connexion and the outside atmosphere should not exceed 0.20 in. W.G. (10% greater pressure and 5% greater flue velocity than measured in the worst case) for a downdraught and 1.25 in. W.G. (again 10% greater pressure and 5% greater flow than measured in the worst case) for an updraught.

Within these limits of test it is suggested that the air-gas ratio should pass through a minimum, the value of which must exceed 1.5 (*i.e.*, 50% excess air). This figure allows a margin of safety to cover depreciation on the performance of the heater during life, the lower safety limit of which is 1.2. The presence of a minimum ensures that failure will not occur just outside the pressure limits. The upper limit of the air-gas ratio is of less importance, and it is suggested that it should not exceed 1.5 of its minimum value.

The authors wish to thank the Directors of Ascot Gas Water Heaters, Ltd., for permission to publish this paper, and Mr. A. Whitaker, O.B.E., who has shown great interest in the work and offered much valuable advice.

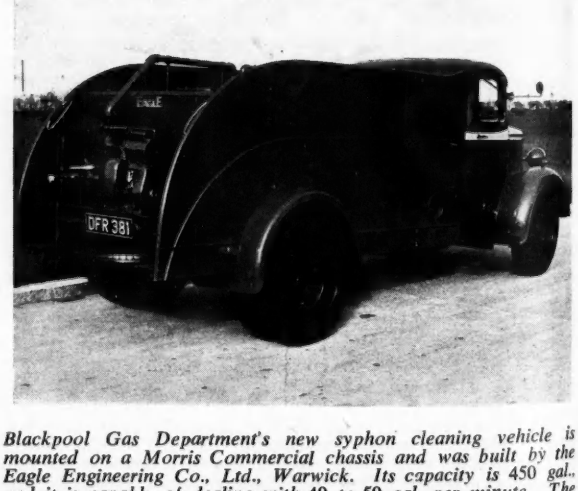
GAS SUPPLIES FOR N.C.B. RESEARCH

Cheltenham and District Gas Company has signed a contract with the National Coal Board for a large supply of gas to a new Central Research Station which is being built by the Coal Board at Stoke Orchard, near Cheltenham. To supply the station will involve laying new mains, and the Company has arranged with the local Councils involved to lay the mains in the same trenches as the water mains. It is understood that the new station will do experimental work on coke ovens, among other things.

Stoke Orchard, where a factory has been taken over for the use of the station, has been chosen as an ideal spot because it is adjacent to but not in a coalfield. Research teams from South Wales and London have now moved into the factory and are engaged in erecting equipment brought from their former scattered laboratories. The officer in charge of the Central Research Station is Dr. D. C. Reece-Jones, formerly Chief Scientist of the Western Division of the N.C.B.

Cheltenham gas undertaking is anticipating extra business from the supplies of gas which will be needed in the homes of the 1,000 members of the staff of the station.

SYPHON CLEANING UP-TO-DATE



Blackpool Gas Department's new syphon cleaning vehicle is mounted on a Morris Commercial chassis and was built by the Eagle Engineering Co., Ltd., Warwick. Its capacity is 450 gal., and it is capable of dealing with 40 to 50 gal. per minute. The vehicle is fitted with a Ransome & Rapier auxiliary pump.

GAS UNDERTAKINGS' RESULTS

Shrewsbury Gas Light Company

The accounts for the year ended June 30 show a profit on revenue account of £24,049, compared with £13,610 last year. Gas sales yielded £113,731 against £111,695, and the year ended with a total of 12,753 consumers, of whom 9,122 had prepayment meters. A final dividend of 6%, making 9% for the year, absorbs £5,146 and leaves a balance of £7,570 to be carried forward, against £7,343 brought in.

Bolton Gas Department

A net profit of £27,445 was recorded for the year ended Mar. 31, compared with £2,359 in the previous year. No contribution was made to the depreciation and renewals fund; the amount contributed last year was £35,000. A balance of £13,986 in the fund has been transferred and, together with the net profit, has turned a deficit of £35,176 at the beginning of the year into a surplus of £6,255. Of the year's capital expenditure of £72,259, £70,121 has been met by borrowing and £2,137 out of revenue. The production of 1,667 mill. cu.ft. of gas was the highest in the history of the Department. Net income from the sale of gas was £380,889 compared with £360,039 the previous year. Meter rents brought in £10,694. The number of consumers rose from 29,383 in 1894 to 57,199 in 1934; last year it was 51,851.

Burnley Gas Department

Gross profit for the year ended Mar. 31 was £57,791 against £47,531 for the previous year, and the net profit was £14,545 against £13,520. Capital expenditure was incurred to the extent of £41,416, including £8,951 for meters, £25,583 for hire-purchase appliances, and £6,882 for mains, and the net capital indebtedness at the end of the year was £203,283, equal to £146 per mill. cu.ft. of gas sold, against £193,780 at the beginning of the year. The average price charged for gas showed an increase of only 17% over pre-war rates. Coke oven gas received during the year increased by 63,797,146 cu.ft., and gas made a decrease of 18,066,000 cu.ft., giving a net increase in total gas made and purchased of 45,731,146 cu.ft. Gas sales showed an increase of 7.2%. Industrial sales were 26.7% up on the year, and 115.6% over the pre-war total, while domestic sales were 0.1% lower than for the previous year. The Engineer and Manager, Mr. A. F. Ames, who has retired since the report was prepared, reviews his 14 years' service, during which gas sales have risen by 42% and the largest daily consumption has jumped from 4,244,000 cu.ft. to 6,050,000 cu.ft. The increase in gas sales necessitated consideration of extensions to the works, and a scheme was prepared and accepted by the Ministry of Fuel and Power for enlarging the capacity of the works by adding a complete new unit at a cost of £373,309. This work has been sanctioned and let to various contractors, and it is hoped that a start will be made early in 1949. In 14 years appliances have been sold to a total value of £421,697, and the outstanding debt on the Department has been reduced from £366,889 to £203,283.

GAS STOCKS AND SHARES

The week was notable for the fact that notwithstanding the unsettled international situation British Funds reached their highest level since January with an index figure of 113.32 on Tuesday, closing at 113.16 on Thursday, compared with 113.11 a week earlier. Industrial securities were also stronger than they had been since June, with an average rise of 1.3 points on the week. The Government announcement concerning the steady decline in the gold and dollar deficit for the third quarter of the year had little effect on the stock market.

The Standard Industrial Trust announced heavy over-subscription for the offer for sale of 400,000 5% Cumulative Preference £1 shares at 22s. each and 600,000 Ordinary 5s. shares at 10s. each in Woodall-Duckham, Ltd. Over £5 mill. was received in application money, and the lists, which opened at 10 a.m. on Tuesday, closed five minutes later.

Gas stocks were mildly firm with a decline in the number of dealings reported on the London Stock Exchange to 202 for the week ended Thursday evening, compared with 226 for the previous week and 250 a week earlier. Prices generally remained well above the compensation level and most of the few changes reported during the week were in an upward direction, an exception being Primitiva Holdings, which dropped 6d. to 10s.

The week's rises and falls were as follows:

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Associated Gas & Water, 4½p.c. Irred. cum. pref.	18/3	—19/3	+ 3d.
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Gas Light and Coke, ord. ...	22/9	— 23/9	+ 1
Hastings & St. Leonards, 3½ p.c. std. (xd. Oct 13.)	80	— 85	— 2
Imperial Continental, cap. ...	110	—115	+ 2
Liverpool, 5 p.c. ord.	121	—126	+ 1
Oxford, cons. ord.	205	—215	+ 5
Primitiva Holdings, ord. ..	9/-	—11/-	— 6d.
United Kingdom Gas Corp. ord. (xd. Oct. 13)	22/9	—23/9	— 3d.

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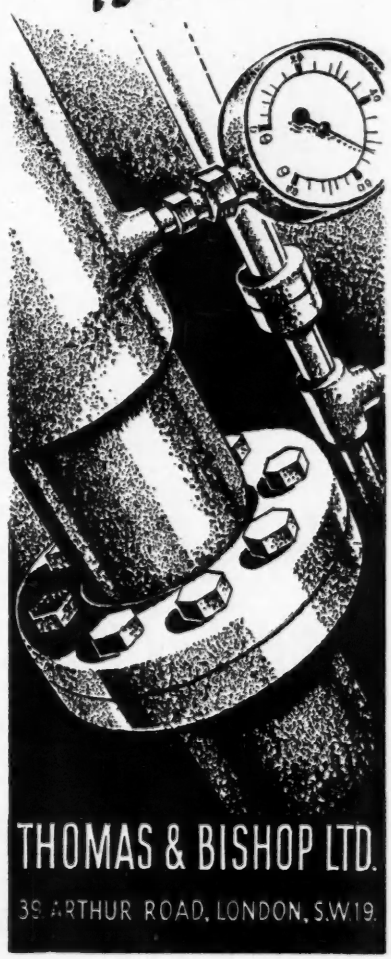

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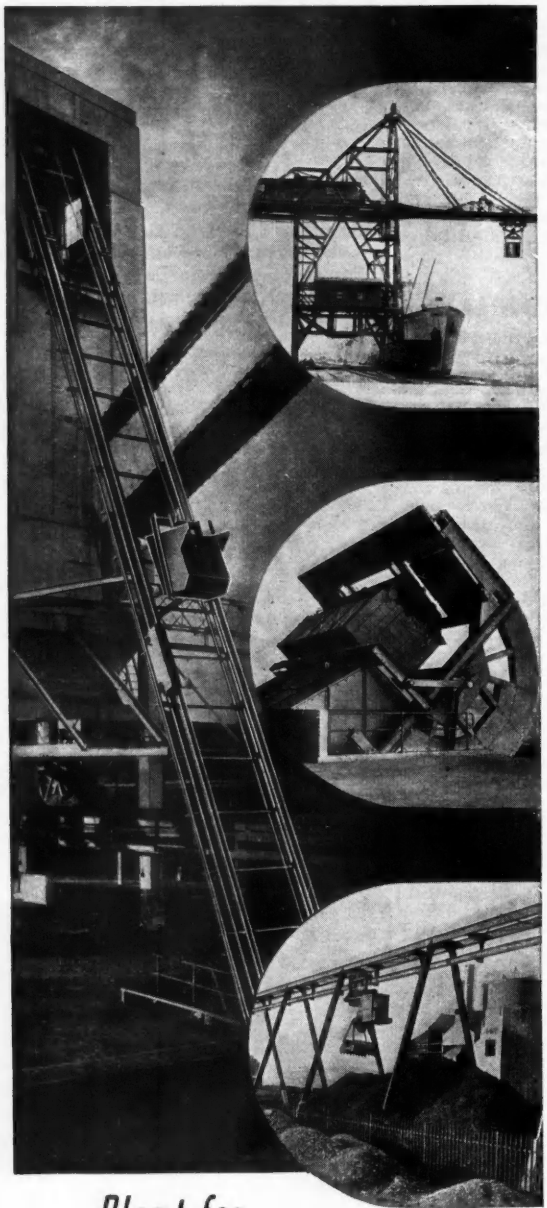

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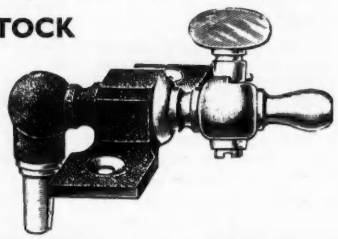

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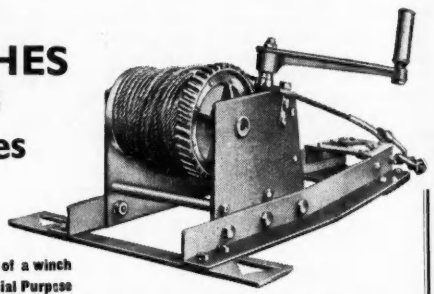

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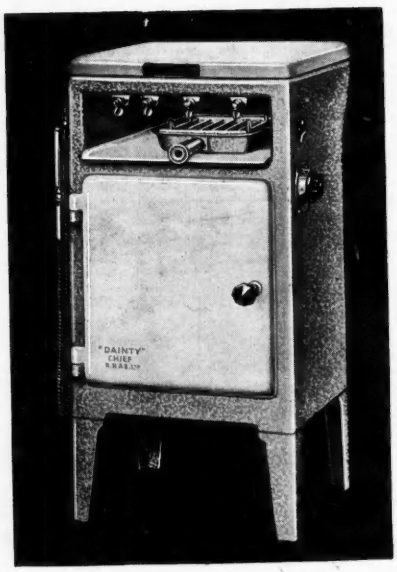

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